THE METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD, THE BRASS FOUNDER AND FINISHER, THE ELECTRO-PLATERS REVIEW, COPPER AND BRASS
A TRADE JOURNAL RELATING TO METALS AND ALLOYS

OLD SERIES.
Vol. 19. No. 9.

NEW YORK, SEPTEMBER, 1913.

NEW SERIES.
Vol. 11. No. 9.

THE USE OF METALS IN LARGE ENGINEERING PROJECTS

SOME INTERESTING FACTS CONCERNING THE CATSKILL WATER SUPPLY FOR NEW YORK CITY.

THE METAL INDUSTRY has from time to time published descriptions and illustrations of the large bronze castings that were made for use in the construction of the Catskill water supply for New York City. Among these were the gate valve stems (March and October, 1911) and the blow-off valves for the Hudson River siphon (June, 1913). We are enabled at this time to show (Figs. 2 and 3) the valve in a still more advanced condition, nearly ready for shipment to its final resting place. This valve was cast as was told in THE METAL INDUSTRY for June, 1913, at the plant of the American Manganese Bronze Company at Holmesburg, Pa., and was finished by the Chapman Valve Company, Indian Orchard, Mass. The amount of bronze-brass, etc., to be used in the entire work of the Catskill water supply is something beyond the conception of the average person. To state that *three million* pounds will be used is merely to make a statement that will be accepted as a fact, and its significance will be lost. It is only by looking at these tremendous castings and studying their history that one can realize just what a wonderful piece of engineering they really are. In following the entire series of operations, from the first planning and decision that such a casting will be needed or can be used, the making of the patterns, the building of the mold, the melting of the metal, the pouring of the casting, to the point where the work is finally finished and put into position, we cannot fail to be greatly impressed with the marvelous ingenuity of man, and then we can begin to understand the real scope of this great water supply system. By glancing at the casting shown in Figs. 2 and 3 and noting the size of it compared to the figure standing beside it we can readily believe that here is a piece of engineering designed to endure for all time.

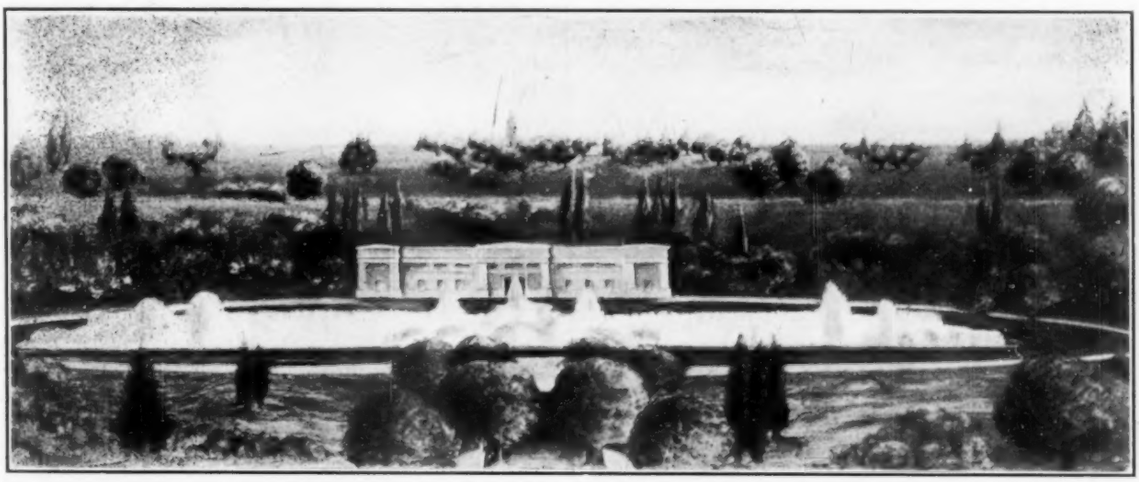


FIG. 1. AERATION, GATE HOUSE AND DIKE, ASHOKAN RESERVOIR.
THE ARCHITECTS' CONCEPTION OF THE LANDSCAPE EFFECTS OF THE FINISHED AERATOR FOR PURIFYING THE WATER.

EARLY HISTORY OF WATER WORKS.

At this time it may be interesting to give a brief history of the water works now under construction by the New York Board of Water Supply. To keep pace with its growth of approximately 135,000 persons per year, it was long ago recognized that additions to New York's water supply system would be inevitable. Indeed, additions have been made at irregular intervals ever since the city first became possessed of a general water supply system. As far back as 1896 the subject of supplementing the existing Croton and Ridgewood systems was taken up by the Manufacturers' Association of Brooklyn. In 1901, following the agitation by this association, a bill was introduced in the Legislature having for its object the creation of a commission empowered to add to the water supply of the city. In 1899, Comptroller Bird S. Coler caused an investigation of all the available sources to be made by John R. Freeman, consulting engineer. Still later, in 1902, Commissioner of Water Supply Robert G. Monroe appointed the Burr-Hering-Freeman Commission to investigate this question. As the result of all

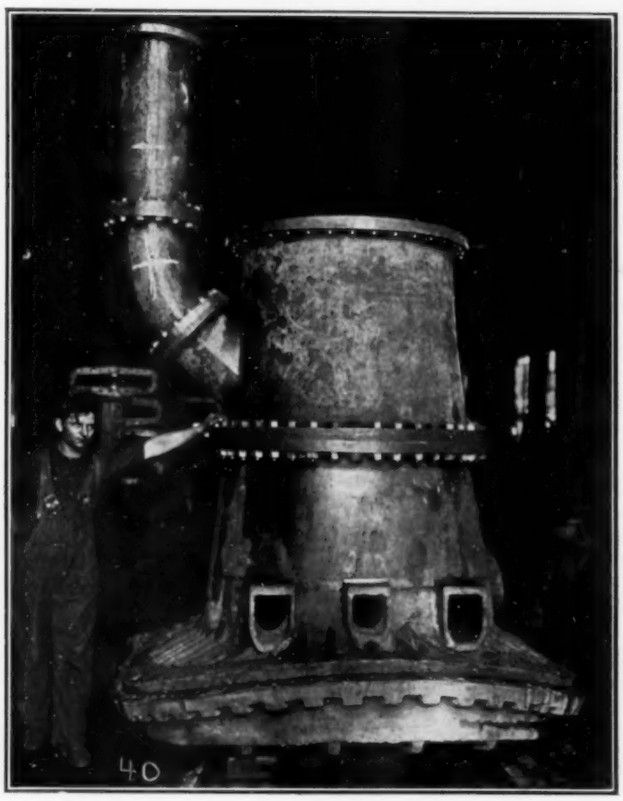
these studies, the Legislature on June 3, 1905, under Chapter 724 of the Laws of that year, authorized the work now being done by the Board of Water supply. Mayor George B. McClellan on June 9, 1905, appointed the first members of the board from three lists of three names, each submitted at the Mayor's request by the Chamber of Commerce of New York, the Manufacturers' Association and the Board of Fire Underwriters.

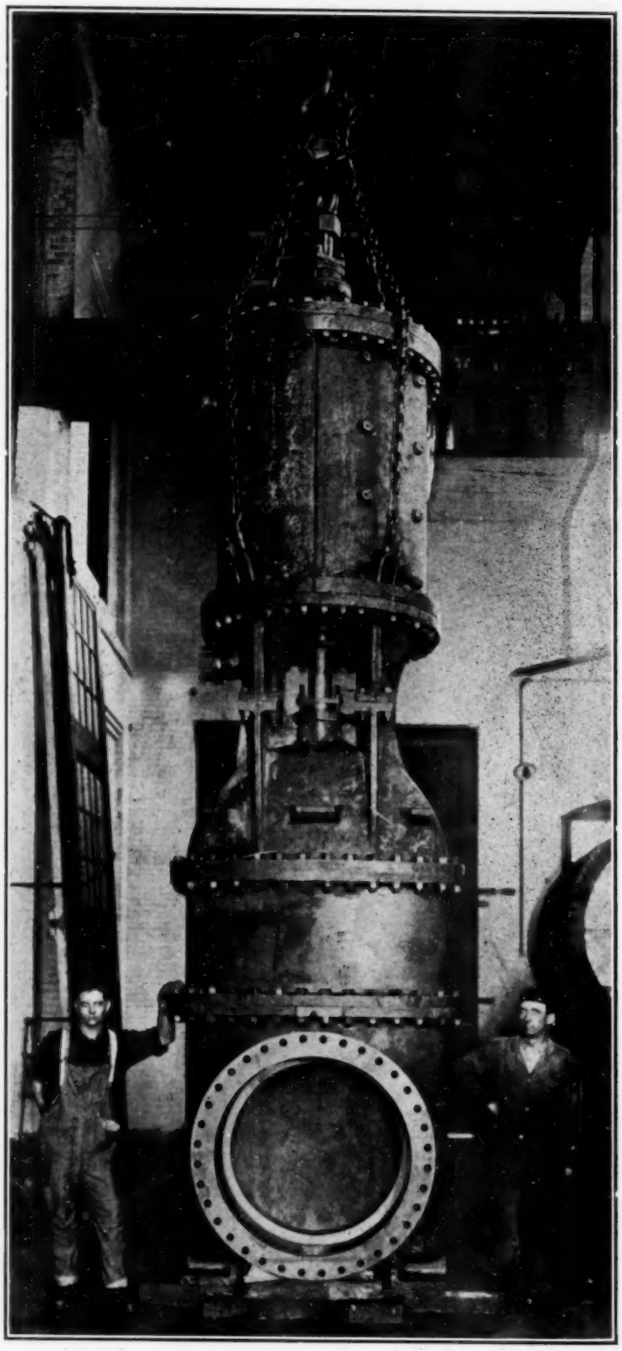
On October 9, 1905, the Board of Water Supply submitted for approval to the Board of Estimate and Apportionment a plan for obtaining from the Esopus, Rondout, Schoharie and Catskill creeks a supply of not less than 500,000,000 gallons of water daily at an estimated cost of $161,857,000. On October 27, 1905, this plan was unanimously approved by the Board of Estimate and Apportionment, and on November 3 of that year application was made to the State Water Supply Commission for its approval, as provided by law. On May 14, 1906, this approval was granted, and in less than six months the first construction contract, for 11 miles of aqueduct, was let.

The completion of the plan for the delivery of Catskill water to all the boroughs of the city was first approved by the Board of Estimate and Apportionment on December 10, 1909, and again after exhaustive investigation, under another city administration, on July 1, 1910. This plan for the delivery of water to all the boroughs of the city increased the estimated cost by $15,000,000, the plan of 1905 having included no provision for the delivery of water to the boroughs of Manhattan, Queens and the Bronx. Such delivery was, of course, contemplated from the beginning, but the problem required prolonged study, and, therefore, a satisfactory scheme could not be elaborated in time to be embraced in the board's first report, determining the general scheme for a new supply.

GENERAL DESCRIPTION OF CATSKILL WATER SYSTEM.

The four drainage areas, or watersheds, from which the new supply is to be drawn, are situated west of the Hudson river, in the Catskill Mountains, and lie between lines 75 and 135 miles from New York's City Hall. This region is sparsely settled. In the aggregate these watersheds have an area of nearly nine hundred square miles, and individually, as follows: Esopus, 255 square miles; Schoharie, 228 square miles; Rondout, 131 square miles;





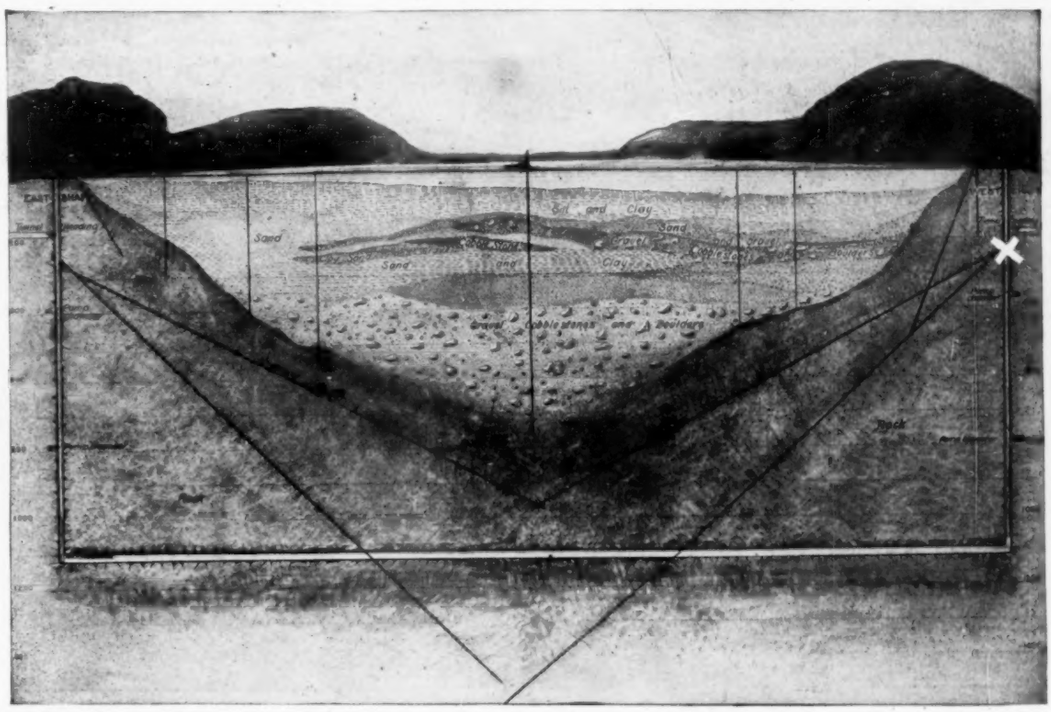
Figs. 2 and 3. These castings are of bronze and constitute a "blow-off" valve for the Hudson River siphon. The casting in Fig. 2 weighs 30,000 pounds. These castings were cast by the American Manganese Bronze Company, Holmesburg, Pa., and finished by the Chapman Valve Company, Indian Orchard, Mass. The part shown in Fig. 3 fits on the top of casting in Fig. 2.

Catskill creek, 163 square miles, to which can be added several small contiguous areas helping to make up the grand total. From this gathering ground it is estimated that even in a series of extraordinarily dry years 770,000,000 gallons daily can surely be drawn the year through. To collect these waters for the city's use, several large impounding reservoirs are to be created from time to time, as found necessary, and interconnected by aqueducts. Only the Esopus watershed is being developed now, but its only reservoir, known by the Indian name of Ashokan, is to be by far the largest and most important of them all. From this reservoir the Catskill aqueduct will convey the water into all the five boroughs of the city. Although in a series of dry years the Esopus watershed cannot be depended upon to supply more than 250,000,000 gallons each day, the Catskill aqueduct is, for economic reasons, being constructed of 500,000,000 gallons daily capacity.

stances arise, it is certain that Catskill water can be delivered into Croton Lake within eight months. From Ashokan reservoir to Hill View equalizing reservoir just north of the city line 91 per cent. of all the work necessary for the delivery of water has been completed.

THE ASHOKAN RESERVOIR.

The Ashokan reservoir, the dam of which we show in Fig. 4, about 14 miles west of the Hudson at Kingston, is now being built under contracts amounting, together with the expense for relocating highways and the Ulster & Delaware railroad, to nearly $18,000,000. The water which this reservoir will hold would cover all Manhattan Island to a depth of 28 feet; the area of its surface will be equivalent to that of Manhattan below 116th street. The Olive Bridge dam, across Esopus creek, the Beaver Kill and Hurley dikes, across smaller streams and gaps between the hills forming the natural walls of the



Sectional view of the Hudson River Valley at Cornwall, showing shafts and tunnel by which the Aqueduct crosses the Hudson. The straight and inclined lines are diamond drill bore holes. The tunnel is 3,022 feet long; the central vertical diamond drill bore hole is 768 feet deep; the upper pair of inclined holes are 1,650 and 1,651 feet long, and the lower pair, 1,834 and 2,051 feet long, respectively. The point X shows where the 40-inch blow-off valve shown in Figs. 2 and 3 will be placed.

From the Ashokan reservoir situated in the foothills of the Catskill mountains it is almost a three-days' journey for the water, at the average velocity of flow through the aqueduct, to the Borough of Richmond, which is Staten Island, surrounded by the sea, at the southerly entrance to New York bay. In traversing this distance of 127 miles the Catskill aqueduct skirts along many a steep hillside, pierces mountains, descends beneath rivers and wide, deep valleys, and crosses The Narrows of New York harbor. From Ashokan reservoir to the city's northern boundary there are 92 miles of aqueduct, and between that reservoir and Croton Lake, the principal basin on the Croton watershed, there are 64 miles. Construction operations have been in progress for six years, and the aqueduct is now nearly completed to the city line. Between the Catskills and the Croton 94 per cent. of the work has been done, and the remaining 6 per cent. is progressing so favorably that, if no untoward circumreservoir, the dividing dike and weir dividing the reservoir into two basins, and the waste weir over which the surplus flood waters may safely be discharged, are the principal structures of the reservoir. Up to the end of 1912, 73 per cent. of the work on these structures was completed. The bottom and slopes of the reservoir basins are being cleared of trees, brush, buildings and other objectionable things. The new highways around the reservoir have nearly all been graded, and their bridges, all of reinforced concrete, are under construction. One of these bridges, at Traver Hollow, is a three-hinged arch of 200-foot span, and the bridge crossing the reservoir on the dividing weir will be 1,270 feet long and have 15 arches of 67.5-foot span. A contract for surfacing most of these highways with brick paving blocks on a concrete base and some of minor importance with macadam has been advertised. Construction of these pavements should begin early in the spring. This

type was adopted because of its permanence and ultimate economy.

AERATION AND FILTRATION.

In connection with the headworks of Catskill aqueduct, at Ashokan reservoir, and also at Kensico reservoir, an aerator capable of treating all the water which will flow in the aqueduct is being built. These two aerators are substantially alike and are great fountain basins, approximately 500 feet long by 250 feet wide, each containing about 1,800 nozzles through which jets of water will be thrown vertically into the air. Fig. 1 shows the architect's conception of the landscape effects of the finished aerator. The nozzles are so designed that the water will be divided into a fine spray, thus permitting thorough admixture of oxygen and removal of undesirable gases and matters causing tastes and odors. The jets will be so arranged as to be pleasing in appearance, and the fountains will be well worth visiting when in operation. Although it is not intended to filter the Catskill water at first, provision for a filtration plant has been made by the acquisition of 315 acres of land at Eastview, near Tarrytown, close to the line of the aqueduct, and about two miles below Kensico reservoir. Here a connection chamber is being built in the aqueduct, so that water can in the future be diverted to, and received back from, the filter plant.

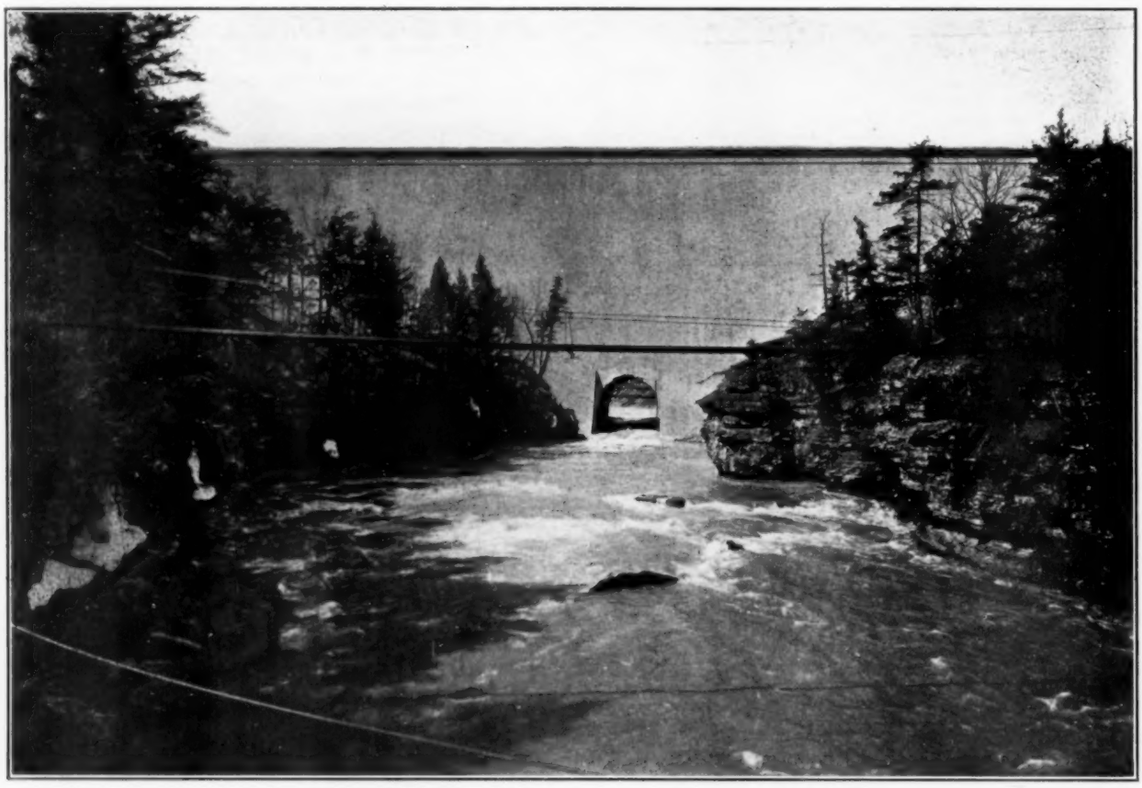


Fig. 4. A view of the completed masonry portion of the Ashokan Dam, November, 1910, showing stream control opening which will eventually be closed. Looking upstream from below.

USE OF METAL IN THE MEASUREMENT OF WATER.

To measure the water drawn from the big reservoir some very large Venturi meters have been built on the line of the aqueduct. These are the largest water meters ever built. There is one just below Ashokan reservoir, a second just above Kensico reservoir, and a third where the water is drawn from Kensico reservoir. Each of these meters is 410 feet long, of reinforced concrete, excepting for the bronze throat castings and the piezometer ring, which is also of cast bronze. In addition to these large meters, five gaging chambers have been built in various parts of the aqueduct where the flow of water can be measured by means of current meters. Special machines are being devised for supporting and moving the current meters when a measurement is being made. Provision is also being made in connection with the city aqueduct for the installation of a Venturi meter upon each connection between the aqueduct and the distribution pipes in the streets.

ORGANIZATION.

The Board of Water Supply consists of three commissioners appointed by the Mayor. Its forces are divided into administration, real estate, police and engineering bureaus. In the former are the secretary, the auditor, the chief clerk, in charge of payrolls, emergency expense accounts and purchasing of supplies, the examiner of real estate and damages, a real estate claim officer, the adjuster of taxes and assessments, and the superintendent of the aqueduct patrolmen. The engineering bureau is composed of five departments, namely: headquarters, reservoir, northern aqueduct, southern aqueduct and city aqueduct. The board and the various bureaus are at present made up of the following men, with the necessary assistants:

Commissioners.—Charles Strauss, President; Charles N. Chadwick, John F. Galvin.

Administration, Real Estate and Police Bureaus.—Joseph P. Morrissey, secretary; John M. Wilson, assistant secretary; Ralph T. Stanton, assistant secretary; Henry C. Buncke, auditor; J. M. S. Millette, chief clerk; A. F. Britton, examiner of real estate and damages; M. S. Eustace, adjuster of taxes and assessments; Walter Le C. Boyer, chief of Bureau of Claims; Geo. F. Shrady, superintendent, Board of Water Supply Police.

Engineering Bureau.—J. Waldo Smith, chief engineer; Merritt H. Smith, deputy chief engineer; John R. Freeman, Consulting engineer; William H. Burr, consulting engineer; Alfred Noble, consulting engineer; Frederic P. Stearns, consulting engineer; Alfred D. Flinn, department engineer; George G. Honness, department engineer; Ralph N. Wheeler, department engineer; Frank E. Winsor, department engineer; Walter E. Spear, department engineer; Thaddeus Merriman, department engineer.

SOME INTERESTING STATISTICS OF ASHOKAN AND KENSICO RESERVOIRS.

	Ashokan.	Kensico.
Capacity, total	132,000,000,000 gallons	38,000,000,000 gallons
Capacity, available	128,000,000,000 gallons	29,000,000,000 gallons
Water surface	12.8 sq. mi. = 8,180 acres	2,218 acres
Land acquired	15,222 acres	4,500 acres
Elevation of water (full reservoir) above tide	590 feet	355 feet
Elevation of tops of dams, above tide	610 feet	370 feet
Length of reservoir	12 miles	4 miles
Length of shore line	40 miles	40 miles
Length of dams and dikes	5½ miles	3,300 feet
Main dam:		
Length	4,650 feet	1,843 feet
Height	220 feet	300 feet
Thickness at base	190 feet	230 feet
Thickness at top	23 feet	28 feet
Width of reservoir, maximum	3 miles	3 miles
Average	1 mile	1 mile
Depth of reservoir, maximum	190 feet	155 feet
Average	50 feet	100 feet
Villages to be submerged	7	.....
Permanent population of villages in 1905	2,000	500
Cemeteries removed	32	none
Bodies reinterred	2,800	few
Railroad being relocated	11 miles	none
Highways to be discontinued	64 miles	14 miles
Highways to be built	40 miles	9 miles
Bridges to be built	10	4
Earth and rock to be excavated	2,936,000 cu. yds.	2,486,000 cu. yds.
Embankment to be placed	8,069,000 cu. yds.	2,003,000 cu. yds.
Masonry to be placed	984,000 cu. yds.	1,286,000 cu. yds.
Cement to be used	1,187,000 bbls.	1,224,000 bbls.
Maximum number of men employed	3,000	1,000

HOT AND COLD METHODS OF OXIDIZING SHEET STEEL

By Charles H. Proctor.

There are only two cold methods that can be used in oxidizing steel. The first is by copper plating the surface of the article in the usual manner of electro-plating and then forming a sulphide of copper upon the surface by immersing in dilute solutions of sulphuret of potassium and water, and afterwards lacquering to protect the finish. In copper plating the articles the solution should consist of the following:

Water	1 gal.
Dry carbonate of copper	6 ozs.
Sodium bisulphite	2 ozs.
Sodium hyposulphite	⅕ oz.
Cyanide of potassium	12 ozs.

The solution should be used preferably at a temperature of 120 degs., and the voltage is from three to four volts. After copper plating from ten to fifteen minutes, the articles should be washed in clean water and then immersed in a solution consisting of:

Sulphuret of potassium	1 oz.
Sal ammoniac	¼ oz.
Water	1 gal.

In a few seconds the articles become black. For a bright finish they must afterwards be washed, dried and tumbled in leather. Then lacquered or the articles may be lacquered with tumbling, which is the method usually followed by manufacturers of electrical apparatus. In cleansing the steel articles use a regular tumbling barrel with from two to four ounces of common washing soda to each gallon of water. The second method of cold oxidizing is to plate the articles in the following black nickel solution:

Nickel ammonium sulphate	6 ozs.
Ammonium sulpho-cyanide	2 ozs.
Sulphate of zinc	1 oz.
Water	1 gal.

The anodes for this solution are the usual cast nickel anodes. With a low voltage from one-half to one volt an intense black finish can be produced that gives satisfactory results. A higher voltage causes the finish to become grayish. After plating the articles are washed, dried and lacquered in the usual manner.

The other methods of oxidizing steel are hot and consist of producing the black magnetic oxide of iron by placing the cleansed articles in a closed retort, heating to a cherry red and injecting dry steam into the retort. Such articles are finally coated with hot linseed oil. Another method (patented) that gives good results is to boil the cleansed articles in a solution consisting of:

Water	10 gals.
Phosphoric acid	2 qts.
Phosphate of iron	1 lb.

During the boiling process a piece of metallic zinc should be immersed in the solution in order to produce a deeper color. The time of boiling should be thirty minutes or more. After drying out in boiling water and sawdust, the articles should be immersed in hot paraffine oil or linseed oil, and, after draining well, finally dried in maple sawdust.

COPPER—ITS USES IN LARGE ELECTRICAL WORKS*

SOME INTERESTING DATA REGARDING THE EMPLOYMENT OF THE RED METAL FOR EVERY DAY USE.

BY JESSE L. JONES.†

In the production of electrical machinery and appliances no other metal plays as large a part as copper. On account of its importance as a material for electrical construction, a brief outline will be presented of its physical characteristics, the methods of its production from native copper, from sulphide or other copper ores and from reclaimed copper, its rolling into sheets or drawing into wire, strap, commutator bars, etc., is melting and casting into sand castings, and some of the more important electrical applications of wrought copper.

PHYSICAL CHARACTERISTICS.

The electrical conductivity of copper is second only to silver. Its specific gravity when wrought is 8.90, according to the Smithsonian Tables, so that it weighs 555 pounds per cubic foot. Cast copper is more or less porous, although our commercial castings usually show a gravity of 8.88. The fracture of cast copper is granular and irregular, while that of rolled or forged copper is fibrous, with a silky luster. Its color is a characteristic red.

Copper is very malleable and ductile and may be drawn into very fine wire or may be rolled into very thin foil. It becomes harder when worked, but by annealing at about 320 degs. C., it regains its malleability. If forged or rolled copper is heated to a red heat, it may be thrown into water and cooled quickly or allowed to cool slowly in the air, and it will be equally soft, differing in this respect from steel.

Copper melts at 1,054 degrees C., is very fluid when melted, has a sea green color, and, when much overheated, as in the electric arc, is volatile and burns with a characteristic green flame. Volatilized copper is said to be poisonous and to produce symptoms similar to lead poisoning, a case having been recorded where a number of workmen were poisoned while melting copper in an arc furnace.

When heated to a red heat copper unites with the oxygen of the air to form one or both of two oxides, which are known respectively as black and red copper scale or oxide. Black copper oxide is infusible, but red copper oxide melts readily and is soluble in molten copper, making it dry and brittle. The readiness with which copper oxidizes renders it necessary to anneal very fine wire in a closed pot or annealing furnace entirely away from the air.

Copper is not tarnished in dry air, but in damp air, in the presence of carbon dioxide, it becomes coated with verdigris (or basic copper carbonate), which is the familiar green stain seen on statuary exposed to the weather. It is also attacked readily by zinc chloride solution (soldering acid), by sulphur or sulphur gases, ammonia, etc., and to a slight extent even by the soldering flux made from rosin and alcohol. The careless use of zinc chloride solution (soldering acid) and certain soldering pastes is responsible for a great many mysterious breakdowns of insulation, as the zinc chloride is very hygroscopic and the fact that it attacks the copper is shown by the insulation turning green.

PRODUCTION OF COPPER.

Lake Copper.—Native copper is found extensively in in the Lake Superior region, on the northern peninsula of Michigan. With the exception of a few mines that produce arsenical copper, the Lake copper is of remarkable purity. This copper is seldom found on the market at the present time, most of it being contracted for by the makers of wire, sheet copper, etc. As mined, Lake copper seldom runs over 3 per cent. metallic copper, although large masses weighing several tons have been found. The rock containing the finally divided native copper is crushed by stamps, concentrated on jigs and concentrating tables and finally melted in reverberatory copper furnaces, requiring no further treatment than poling* to reduce the oxides and bring it to touch pitch. It is cast into cakes, slabs, billets, ingots or wire bars, which are then ready for subsequent manufacturing operations. Much of the Lake copper is so high in silver that it is refined electrolytically, the silver being recovered.

The recently issued specifications of the American Society for Testing Materials for Lake Copper provides that Lake copper must originate in Northern Michigan and that wire bars must have a resistivity not to exceed 0.15535 international ohms per meter-gram at 20 degs. C. (annealed), 100 per cent. conductivity being based on copper having a resistivity of 0.153022 ohms. Arsenical Lake copper having a resistance of above 0.15694 ohms, when required for special purposes shall be the subject of special agreement as to arsenic content. Lake copper sold for wire bars must have a purity of 99.88 per cent.

Electrolytic Copper.—The greatest portion of the copper production of the United States does not come from native copper, but from the ores of Montana and Arizona, which consist of copper and sulphur, or copper, iron and sulphur. These ores are usually roasted to remove a portion of the sulphur, arsenic and other volatile impurities. They are then smelted with coke in a vertical furnace producing a matte or compound of sulphur, copper and iron that may contain 30 per cent. of copper. This matte may be stepped up to a higher copper content in various ways, or it may be run into a Bessemer converter, the iron and sulphur burned off and the resulting coarse or crude copper, which may be 99 per cent. pure, is cast into anode plates and electrolytically refined, the resulting electrolytic copper being often superior in purity to Lake copper. The less pure grades of electrolytic copper are known as casting copper and are sold for making brass castings and for uses where a high conductivity is not required. The American Society for Testing Materials specifies the same resistivity and purity for electrolytic wire bars as for Lake copper wire bars, thus placing the two grades of copper on an equal footing. However, Lake copper often commands a somewhat higher price than electrolytic copper.

Reclaimed Copper.—Large amounts of scrap wire, coils, copper dust, turnings, etc., accumulate at an electrical works, and, as this copper is very pure, it has been found profitable to run it down into ingot copper in a copper refining furnace, rather than to sell it as scrap copper. The only impurities in this class of copper are lead and tin that come from the soldered joints, etc. The tin is readily removed in the refining furnace, as is most of the lead, so that the resulting copper is of sufficiently high grade to be used for any rolling or forging purpose, although not being as uniform in quality as Lake or electrolytic copper. For casting purposes this reclaimed copper is very satisfactory, and it is much purer than the

*Address before the Pittsburgh Efficiency Club (Electrical Club Journal, September, 1913).

†Metallurgist, Westinghouse Electrical and Manufacturing Company, Pittsburgh, Pa.

*Introducing poles of green wood into the molten metal.

ordinary brands of electrolytic casting copper, as it will average 98 per cent. conductivity against 90 per cent. conductivity for ordinary casting copper.

ROLLING AND FABRICATION.

The copper cakes used for rolling into sheet copper and the wire bars used for the making of wire are of what is known as "tough pitch" grade. They are cast in open copper molds and are not "overhauled" or machined on the top side as is brass that is intended for rolling. As a result, the cakes and wire bars are usually rough on the top side because of dross and scale, and are full of minute pinholes. The modern practice of using very large furnaces and refining copper in heats of 100,000 pounds or more has made it difficult to keep the pitch uniform throughout a heat. Many refiners, for this reason, claim that a refining furnace should not exceed a capacity of 20,000 pounds. In the rolling operation, the pinholes and other defects are very much elongated and may appear in the finished product as "streaks," slivers and other imperfections. The side of the sheet that corresponds to the bottom of the copper cake always presents a better appearance than that which corresponds to the top of the cake.

The furnaces used for heating the copper for rolling are of the reverberatory type, and in a late form used for heating wire bars the wire bars are elevated on a moving platform, pushed into a sloping furnace by a mechanical charger and descend by gravity, being removed from the bottom of the furnace when at a red heat and going directly to the rolls.

Sheet copper is rolled by what is known as the "Welsh or cross-rolling" system in some mills. In most mills, the "straight-rolling" system is used, which consists in rolling a plate to 0.25 or 0.75 inches thick, cutting it to the proper weight for a desired gauge of sheet, then heating and rolling in packs on finishing rolls to the desired lengths as is done with sheet steel. Sheet copper is coated with an emulsion of guano before commencing to anneal it, and this causes the scale to loosen more readily when the hot copper is plunged into water.

Hot rolled copper is not as smooth or as close to gauge as is required for many purposes, so that much of it is subsequently cold rolled. This makes it smooth, stiff and elastic. To remove the buckles from the sheets, they are clamped in a stretching machine and hydraulic pressure applied in slight excess of the elastic limit of the copper. The sheets are now perfectly flat and they are sheared to remove the marks of the clamps of the stretching machine.

Wire, strap, commutator bars, etc., are rolled down from the original wire bars to a suitable size and then finished by drawing through hardened steel dies. These dies soon wear and fail to retain their original dimensions unless all annealing scale is carefully removed from the copper. This is done by quenching the annealed wire, strap, etc., and then washing it with a hose, using water under 200 pounds pressure. Excessive wear of the dies is also prevented by lubricating them well with tallow, soft soap, or other lubricant. For the finest sizes of wire, the dies are made of diamond instead of steel.

Copper may be extruded but not so readily as brass, and, in order to obtain greater density, hardness and accuracy, some special shapes which would be expensive to machine are extruded and then cold drawn.

Where very large terminals and similar pieces are required, they are forged in the blacksmith shop from billets or ingots that have been made of suitable size. The possession of a copper refining furnace is quite a convenience when work of this kind has to be made.

CASTINGS.

Many applications are found for high conductivity sand castings of copper, viz., terminals, dampers, collectors, switchboard work, etc., and such castings form a considerable percentage of the output of the brass foundry in an electrical works.

When cast in green or dry sand molds, copper shows a tendency to rise and become porous, hence the production of sound copper castings is a foundry problem of considerable difficulty and requires great care in the making of the molds and the melting and pouring of the copper. The molten copper must at all times be kept well covered with powdered charcoal or some similar material to prevent the formation of red oxide of copper, which has the property of dissolving in the copper, making it "dry" or brittle and producing porous castings. Graphite crucibles are generally used in melting copper for castings. Open flame furnaces are much better, however, as the copper can be melted with less oxidation and it can be conveniently poled as is done in the regular reverberatory copper refining furnace. As a consequence, the copper will require very little further deoxidizing.

In addition to using great care in melting to avoid burning the copper, it is necessary, in order to get solid castings, to use a small amount of some deoxidizing agent such as silicon copper, magnesium, aluminum or boron to reduce any suboxide of copper that may have been present in the copper originally or that may have been formed during the melting operation. Silicon copper is the most practical and satisfactory deoxidizer for copper. By its use copper castings of 80 per cent. conductivity may be regularly obtained, and with careful melting and by avoiding any excess of silicon over 90 per cent. conductivity may be had. Sound castings, free from blowholes, may also be made by the use of aluminum and magnesium, but these deoxidizers (especially magnesium) are liable to produce dirty castings. A large excess of silicon copper will also produce dirty castings and give a weak brittle copper casting of low conductivity.

In cooling from the molten to the solid state, copper contracts or shrinks very considerably, and if the molds are too rigid or cores too unyielding, cracked castings result. Often invisible hair cracks may be present in a copper casting and may be undiscovered even after machining. When put in use and subjected to working stresses, these hair cracks may then cause a rupture of the casting.

THE ELECTRICAL APPLICATIONS OF WROUGHT COPPER.

The largest use of copper in the electrical industry is in the form of wire, ribbon and strap. These forms may be insulated with cotton, silk, asbestos, linen, enamel, treated paper, treated cloth, etc. These insulated coatings may be further treated with paraffine, resins or other water-proofing materials such as asphaltic pitch, etc., or with powdered mica and soapstone. Cotton covered wire is used in field, armature and transformer coils. Asbestos covered wire is used in field, armature and magnet coils exposed to high temperatures and is supposed to stand a "dull" red heat without being destroyed. Rubber insulated wire is used for general service, but the sulphur in the rubber attacks the copper so that the copper must first be coated with tin, which is inert to sulphur. In the winding of coils it is important that the copper be soft annealed. The winder can usually tell whether the wire or strap is too hard by the "feel" of it. It is difficult to show this hardness in figures, but it is best done by ascertaining the true elastic limit.

One of the more recent methods of insulating copper

wire for use in winding coils for low voltage work is by means of a flexible baking enamel. This enamel is not affected by moisture, withstands a temperature of 500 degs. F. without injury, and is much thinner than a silk or cotton insulation. Wire for enameling must be a good grade of soft copper wire and any joints must be identical in softness and dimensions with the rest of the wire and have at least 95 per cent. of its strength. Any "copper grease" on the wire must be thoroughly removed by drawing through sand, as "copper grease" may run as high as 90 per cent. metallic copper and this would affect the insulation value of the enamel. Where enameled wire is used for higher voltage work, especially on the larger sizes of wire, a single cotton covering is added.

Where one copper wire has to be connected with another in a coil or reel, it may be done either by electric welding or silver soldering. In electric welding the copper may be burned and the joint become hard and brittle. In silver soldering a solder composed of equal parts of silver and sheet yellow brass is generally used, but the more particular manufacturers use pure silver reduced to a powder suited to the gauge of the wire to be soldered. Pure silver will give a softer joint and one of higher conductivity than silver solder. Either electric welding or silver soldering will give a good joint, as was shown by the following test: Four pieces of bare copper ribbon, 0.162 x 0.250 inches, electrically welded, broke at 1,066, 997, 1,165 and 1,085, or an average of 1,078 lbs.; four similar pieces, silver soldered, broke at 1,258, 988, 1,193 and 1,267, or an average of 1,177 lbs. The average of four tests on the same section of copper not welded or soldered was 1,350 lbs.

Brush copper is cold rolled and very thin, as it is required to be very flexible and springy. This use and that of sheets for stamping constitute the largest uses of sheet copper in an electrical works. Stamping copper or "streakless" copper, as it is sometimes called, is subjected to very severe punishment in forming arc lamp parts, various heating utensils, etc., and is required to be dead soft and of unusual ductility.

Commutator bars are hard drawn and are required to be of a uniform degree of hardness and free from slivers and similar defects. The copper used for making switches comes in the form of bars and straps. It also is hard drawn, has a smooth surface, high finish and must have high conductivity.

A PLATER'S STORY

THE VICISSITUDES OF AN ACTUAL PLATER IN HIS COMPETITION WITH THE PRETENDING PLATER.

BY D. S. GRUNTEL.

It has come within the range of my experience in plating to note, that while in most other trade and professions, men who excel in their specialty are more valued and get their recognition and remuneration accordingly, the recognition of a plater's merits goes in the opposite direction. I don't mean by that those managers of plating departments, who manage to get and hold some of the best positions on the strength of some bold pretensions, or some mysterious influence, etc., but the plater who has to think too intensely how to surmount difficulties, to overcome obstacles, to create facilities, and to devise ways and means for reducing cost and increasing efficiency, whose mind is kept riveted on a dozen things or more, at the same time. These are the silent platers, who unfortunately for themselves have hardly time or inclination to talk during working hours, but carry out and do the work going through their departments. The talker and pretender gets the cream, the actual performer gets the skimmed milk, even that often baptized with water. I can cite a case from a number of cases to verify the truth of my statement.

In a medium sized city, I started to work as a buffer and polisher. Pretty soon I observed that there was something wrong with the plating department. I did not need to look into it, but decided that the firm preferred to lose three or four times as many dollars in the cost of production with a cheap incompetent plater, than to reduce it by that sum with a decently paid competent plater. I also came to the conclusion that this same firm never had, never wanted and never cared to have a first-class plater, because I was put in charge of the plating department at the magnificent salary of $18 a week to take care of the following plating tanks:

Two 1,000-gallon nickel tanks, five 500-gallon nickel tanks, four 600-gallon acid copper tanks, three 500-gallon cyanide copper tanks, one 175-gallon brass tank, one 300-gallon black nickel tank.

Besides sand pickles, oil of vitriol pickle, muriatic acid pickle, bright brass dip, electro-cleaner, potash solution and oxidizing solution. When I started to run it, I found the most cumbersome, clumsy racks, rods and hooks of iron, that were made still more cumbersome with the heavy alternate deposits of copper and nickel, which had accumulated there for a great number of years, consequently shading and spotting at the places of contact all work, and besides offering great resistance to the electric current.

I at once recommended plating racks, rods and hooks made of brass, but the gentlemen above me after consultation, perhaps, decided I must be a poor plater for recommending such an expensive innovation, especially as their former platers used to run the work through in the old way. I did so but only because I had to, but at least I had the ancient layers of plate hammered off from the racks of iron, so that they look and work a good deal slicker than they used to. My chief fault was only to look and see beyond the tip of my nose, that it will ultimately cost ten or a hundred times more than the price of brass racks would have cost the firm.

I have in mind the time when the commutator on the dynamo gets worn out, when the nickel and other anodes are used up, when the iron racks will again become loaded with heavy layers of plate, in a word, when the least resistance will be needed most, and will be the hardest to obtain. Even if the anodes are replaced, many hundred dollars will be lost, until the source of all troubles be eliminated. By that time I hope to be pasturing in newer fields, as I would not like to have them exclaim in a chorus: "The longer you are here the worse you are getting." While looking around into all kinds of corners and nooks I found a great quantity of worn out copper and nickel anodes piled up in barrels, and boxes to be thrown out or perhaps sold as scrap, for a sum which would bring mighty little satisfaction and still less returns for the firm. So I dug them up, scraped and scrubbed them, put them into use as anodes again, so that the firm may reap a hundred times more benefit from them in the shape of anodes.

The plating is done mostly in iron, yet there was no muriatic acid dip or pickle, nor a cyanide dip for the copper buffed work. Even the water was used as sparingly, as if it had been Lithia, or Waukesha Spring water. Any

real plater who reads this will wonder how for the love of Mike did this big firm manage to get such specimens of platers for such a large shop. It is needless to say that my predecessors used to be paid better than I, for their lack of troubles, lots of nerve and a brass front.

The ability of a cheap incompetent plater lies in his capability to increase the cost of production in comparison with the ability of a well-paid competent plater to decrease the cost of production. Both are platers, but each can bring different results. Employers are in a scramble to get the cheap man, who knows how to decrease profits instead of the better, higher grade man, who knows how to increase profits and reduce losses. In this instance I write in reference to the foreman plater, who can be indorsed by the American Electro-plating Society, and the other who cannot be indorsed. The former uses his accumulated experience for the firm's profit: the latter accumulates his experience at the firm's expense. My demonstration so far is only the razor edge of the entering wedge. It's up to the firm, whether further advanced efficiency should be restricted and retarded, or promoted and accelerated.

THE DETERMINATION OF OXYGEN IN COPPER AND BRASS *

A Description of a Reliable Method for the Estimation of This Troublesome Element in Copper Alloys.

By T. West, M.Sc. (The University, Manchester).

During the last few years several papers dealing with the presence of oxygen in copper and its alloys have been read before the Institute of Metals, and both in the papers and in the ensuing discussions a further recognition of the influence of oxygen on the properties and behavior, not only of copper, but of metals and alloys in general, has been urged upon all who are interested in their manufacture and use.

Oxygen may by its presence in a metal exert a beneficial influence as in the case of copper containing arsenic, where it has been found that the presence of a certain amount of oxygen in proportions determined by the quantity of arsenic is most beneficial. Rose also states that a small quantity of oxygen in the form of oxide of lead is most useful in preventing the brittleness of standard gold. But more generally the oxygen is present owing to unavoidable oxidizing effects produced during the various manipulations involved in manufacture. In the latter case, although the amount may be very small yet it may have most damaging effects on the "life" of the casting in which it is embedded.

As it is known that the presence of oxygen has certain effects on alloys, further assistance in the explanation of its influence is given by a knowledge of the manner in which the oxygen occurs in the mass of metal. A microscopic examination of the substance often explains the apparently unaccountable behavior of some casting. With the alloys of copper such an examination shows that the oxygen enters intimately into the structure of the alloy, and though interpretations of the manner in which it exists chemically may vary, it undoubtedly prevents other impurities exerting such a harmful influence on the mechanical and physical properties of the copper. In other cases, where the presence of the oxide is accidental, it is generally observed scattered amongst the crystals, but more often along the crystal boundaries, thus acting as a source of weakness, while as so lucidly explained by Law (1) quantities of oxide, often unobserved in microscopic examination owing to their minute amounts or to removal during preparation for examination, may be responsible for many cases of corrosion.

For a thorough investigation of the influence of oxygen, the determination of its absolute amount is necessary before strictly comparable tests can be carried out. With this object in view some experiments have been carried out, the work in connection with which is embodied in this paper.

The determination of oxygen in copper now presents little difficulty, as a satisfactory method is known which gives results of the required degree of accuracy. Greaves (2), in an appendix to a paper on "The Influence of Oxygen in Copper containing Arsenic and Antimony," gives an excellent summary of the methods for determining oxygen in copper, which renders it unnecessary for full details to be given here. In this summary he classifies the methods for the determination of the oxygen into two classes according as the object is:

(a) To estimate the oxygen existing as cuprous oxide, or

(b) The estimation of the total oxygen.

With regard to the methods for determining the cuprous oxide he says: "In all the above methods there is the uncertainty as to whether the cuprous oxide actually found exists in the copper wholly as free oxide or partly combined with oxides of arsenic or antimony." It is this uncertainty which renders these methods to a large extent useless, because a corresponding uncertainty exists from microscopic examination as to the chemical nature in which the oxygen exists, and so the methods which give the total oxygen find more favor, for the manufacturer desires to know the amount of oxygen, irrespective of its mode of existence, which will neutralize the ill effects of other impurities and have the least tendency to be harmful itself.

The usual method for the determination of the total oxygen is to reduce the heated metal by a stream of hydrogen. Various workers have modified the method which was introduced by Hampe (3), who with elaborate precautions heated small pieces of copper in a current of hydrogen and ascertained the loss in weight of the copper. Archbutt (4) established the accuracy of the method, demonstrating that equally accurate results were obtained by noting the loss in weight of the copper or weighing the water formed. He also showed that the reduction is more rapidly accomplished the finer the state of division of the copper, which need not be heated above redness. Blount (5) melted the copper in a current of hydrogen, while Dickson (6) melted the copper with purified tin in a current of the gas, both experimentalists weighing the water formed.

Turner (7) attempted to apply the method of reduction by hydrogen to the estimation of oxygen in brass, but showed that certain difficulties arise which are absent in the case of copper and so render the method useless. At the outset he showed that any oxygen in brass very probably exists in the form of scattered particles of zinc oxide, which microscopic examination fails to detect owing to their being rubbed out during the operation of polishing. On this assumption he showed that it was useless to attempt to determine the oxygen by ignition in a current of hydrogen. The small amount of zinc oxide likely to exist is reduced by the hydrogen, but on reaching the cooled part of the tube the reverse reaction occurs, which results in the zinc oxide being deposited as a

*Paper read at Autumn meeting of Institute of Metals, Ghent, Belgium, August 28-29, 1913.

fine film on the glass tube, and consequently with no increase in weight of the absorption bulbs. In conclusion Turner says: "It is, therefore, evident that no accurate determination of oxygen in brass can be made by adopting the methods which are suitable for copper," and "A description of a simple and direct process for the accurate determination of oxygen in brass would be appreciated by many who are interested in the subject."

At the suggestion of Professor Carpenter the author carried out some further experiments to obtain, if possible, more conclusive results as to the amount of oxygen to be found in ordinary brass. In place of hydrogen as the reducing agent carbon monoxide was decided upon, and to test the accuracy of this method some specimens of oxidized copper were reduced by hydrogen and the results thus obtained compared with those obtained when the reduction was accomplished by carbon monoxide. Afterwards tests were carried out with brass substituted for copper.

DETERMINATION OF OXYGEN IN COPPER, USING HYDROGEN AS REDUCING AGENT.

For experimental purposes alloys of copper and oxygen were made by dissolving varying quantities of pure cupric oxide in the same weight of pure electrolytic copper. From these mixtures, turnings, obtained by using a lathe working at a low gear to prevent oxidation, were taken for the estimation of oxygen.

Fig. 1 shows the apparatus used in the determination of the oxygen. Hydrogen, generated from pure zinc and sulphuric acid, was purified by passing through a train of wash bottles containing solutions of lead acetate, silver nitrate, and caustic potash, and through a further tube containing pieces of solid potash. Traces of oxygen were removed by passing through a heated Jena glass tube containing copper gauze and absorbing the water formed in sulphuric acid, while the gas finally passed through a tube of calcium chloride. The flow of the gas was regulated by a tap at A. All the parts of the apparatus were sealed together or connected by means of ground glass joints secured by rubber bands. The combustion tube, made of silica, was heated in a gas furnace, and the water formed absorbed in a stoppered **U**-tube containing calcium chloride. A similar **U**-tube was attached to act as guard tube, and an aspirator was attached to the guard tube. The procedure was to weigh about 10 grammes of the copper drillings into a boat, introduce into the combustion tube, and attach the absorption tube, guard tube, and aspirator. A slow current of hydrogen was passed for half an hour, the **U**-tube detached and weighed. On re-attachment the current was passed for about a quarter of an hour, and the reduction then commenced by heating the silica tube to about 750 degs. (measured by a thermocouple). After heating for an hour the combustion was stopped, but the current was passed for a further quarter of an hour. The absorption tube was then detached, carefully wiped, and weighed. From time to time a blank experiment was carried out by heating a roll of previously deoxidized copper gauze and employing the same precautions as above. In these experiments an hour's ignition resulted in the weight of the **U**-tube remaining absolutely constant.

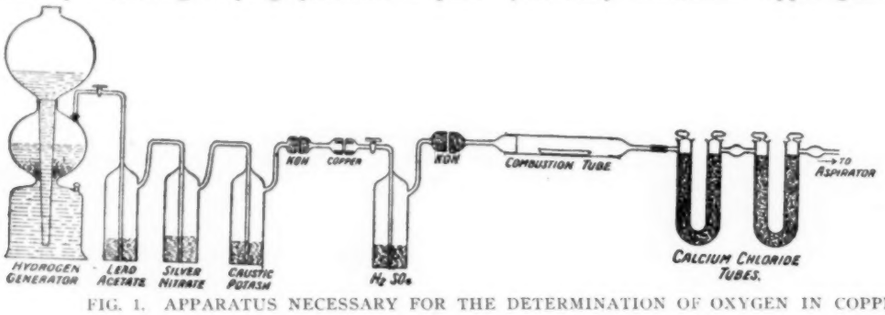


FIG. 1. APPARATUS NECESSARY FOR THE DETERMINATION OF OXYGEN IN COPPER.

The results of the determinations carried out in duplicate with these specimens are given:

	Oxygen.		
	A. Per Cent.	B. Per Cent.	C. Per Cent.
1st Result	0.083	0.175	0.260
2d Result	0.083	0.176	0.258

(To be continued.)

THE ELECTRODEPOSITION OF NICKEL*

A Paper Giving a Resumé of Past and Current Practice in the Art of Depositing Nickel on Metallic Bases.

By Oliver P. Watts.†

(Concluded from August.)

121. "W. Baker and J. Unwin dissolve nickel hydrate in tartaric acid and add potassium hydrate or ammonia nearly to neutralization, so that a double salt is formed."

122. Placet and Bonnet's nickel solution, see bath No. 25, this paper.

123. For Nagel's nickel solution see bath No. 7.

124. For Kugel's nickel solution see No. 23.

C. ALKALINE BATHS:

125. Roseleur's solution:

Nickel ammonium sulphate.....	40 grams
Ammonium carbonate	30 grams

126. Desmur's solution:

Nickel ammonium sulphate.....	70 grams
Sodium bicarbonate	8 grams

The bath is worked nearly at the boiling point. If, after working for some time, the deposit becomes dark, a small lump of sodium sulphide will remedy it. "Of all the solutions of nickel which I have tried," says M. Desmur, "this has, without doubt, given me the best results both as to quickness or working and whiteness of deposit, which is equal to that of silver. Nickel deposited from this solution can be burnished."

121. Bischof and Thiermann's solution:

Nickel sulphate	86 grams

*A paper presented at the twenty-third General Meeting of the American Electrochemical Society, at Atlantic City, N. J., April 3-5, 1913.

†Department of Applied Electro-Chemistry, University of Wisconsin.

Ammonium sulphate	67 grams
Ammonia, sp. g. 0.905	110 grams
Volume	1 liter

Platinum anode. E. M. F. 2.8 volts. Current density 0.5 ampere. "If the bath is too acid, it is necessary to neutralize it. Seventy-five grams of sugar or 100 grams of glucose may replace the gum arabic."

III. MALLEABLE NICKEL.

E. Weston, in his patent, claims to obtain from the solution below "A new article of manufacture—a deposit of nickel which is so tough, malleable and ductile that it can be worked in much the same way as brass or copper are worked by the operations of rolling, punching, drilling, spinning, drawing," etc.

161. Weston's solution consists of five parts of chloride of nickel and two parts of borate of nickel. The amount of water is not stated in the portion of the patent available.

162. Villon's solution of malleable nickel:

Nickel ammonium sulphate	60 grams
Nickel ammonium oxalate	20 grams
Ammonium phosphate	10 grams
Palladium oxalate	0.1 gram

163. Kern's fluoborate solution contained 8 per cent. metallic nickel as nickel fluoborate. In 300 hours at 1.2 amperes per square decimeter the deposit weighed 290 grams and was 5/16 inch thick. "It was bright, smooth, malleable, solid and adherent."

Two solutions previously given are claimed to yield malleable deposits: No. 23, Kugel's, and No. 139, Powell's. Deposits from the following solutions are said to be soft enough to burnish: Nos. 76, 77, 90, 106, 122, 144, 147 and 148.

IV. BATHS PRODUCING THICK DEPOSITS.

Brochet, Langbein, Maigne and Mathey, and Peters, all give the following:

Nickel sulphate	50 grams
Ammonium tartrate, neutral	36 grams
Tannin	0.25 gram

E. M. F. 3.5 volts; current density 0.3 ampere.

"The bath is said to yield a very white, soft and homogeneous deposit of any desired thickness, without roughness or danger of peeling off."

164. Nickel ethyl sulphate. "By the use of an electrolyte which contains nickel ethyl sulphate, or the ethyl sulphates of the alkalies or alkaline earths, deposits of any desired thickness can be produced if the bath be constantly agitated by mechanical means or by the introduction of hydrogen. Agitation by blowing in air is not permissible on account of oxidation of the ethyl sulphates. Experiments with such ethyl sulphate combinations by Dr. G. Langbein & Co. resulted in formulas for prepared nickel salts, from which thick deposits of nickel capable of being polished can in a few minutes be obtained in the cold way. The salts are known in commerce as Mars, Lipsia, Germania and Neptune. In an electrolyte of given composition, which has to be kept slightly acid with acetic acid, nickeling may for weeks be carried on at the ordinary temperature without any peeling off of the deposit, and in this respect this bath surpasses all other known baths. In the course of six weeks Dr. Langbein has produced upon guttapercha mattrices galvanoplastic nickel deposits 6 millimeters in thickness."—Langbein.

165. A. Hollard's solution.

Boric acid	65 grams
Hydrofluoric acid (43 to 46 per cent.)	142 grams
Nickel carbonate	excess
Water	1,000 grams

The boric acid is dissolved in 125 c.c. of boiling water, cooled, put in a rubber jar and the hydrofluoric acid added. The nickel carbonate is slowly stirred in until it remains undissolved, and then stirred for 24 hours by a motor to completely neutralize the acid. It is then filtered. At first the deposit is curly, but after three or four days of continuous operation it works satisfactorily. One may deposit nickel as thick as desired, and the deposit may be used for electrotypes on wax, guttapercha, etc. Nickel can be deposited directly on cast iron and on aluminum.

The writer can confirm Hollard's statement of the suitability of the nickel fluoborate electrolyte for thick deposits. About two years ago the writer began experiments with fluoborate solutions of several metals, obtaining deposits of considerable thickness. Last fall, as the laboratory nickel solution was not working satisfactorily, about three gallons of the fluoborate solution were added to the 30-gallon nickel tank as a corrective. The solution then gave light deposits of excellent quality, but heavy deposits, run for a week or more, were badly pitted by gas bubbles which clung to the cathode. Although he has never collected and analyzed the gas, the writer is inclined to consider the trouble due to air absorbed while the solution stood idle in the summer. After several weeks of occasional use the pitting had diminished considerably, and an attempt was made to secure a really thick deposit of nickel.

Since the regular anodes, over a foot long, were left in the tank, there was naturally an excessive deposit on the bottom of the cathode. The deposit weighs 1,500 grams, and the cathode has a maximum thickness of 30 mm. The edge is 17 to 22 mm. in thickness. The bath operated at room temperature without stirring, and no additions were made to the solution during the 85 days of deposition. The current density averaged about 0.8 ampere per square decimeter. The deposit was brilliant and very satisfactory except for the pits caused by the gas bubbles. Although the cathode was lifted from the solution every few days for examination, there was no trouble from peeling. The deposit is very hard and somewhat brittle. In comparison with those deposits of copper, iron and lead of equal thickness which have come under the observation of the writer, the smoothness and freedom from protuberances of this deposit is remarkable. It is evidently not necessary that the entire bath consist of nickel fluoborate in order to obtain thick deposits.

Of the baths previously described, No. 22, No. 91 and No. 146 are claimed to give thick deposits at ordinary temperatures.

The heating of the electrolyte to prevent curling and peeling of the deposit has already been mentioned, and doubtless the thick deposits claimed for bath No. 22 are due to the elevated temperature specified.

V. Agents for the Production of Smooth Deposits.

"A small addition of gelatine or transparent white glue will give an exceedingly bright lustre to the nickel deposit, providing the deposit is not too heavy."—C. H. Procter.

Bruce adds carbon disulphide to the nickel bath to prevent the deposit from becoming dull when it reaches a certain thickness. "This is not advisable."—Langbein (p. 261).

J. A. Nusbaum obtains smooth, dense deposits of metals by adding to aqueous solutions of their ordinary salts small quantities of colloids, which wander toward the cathode, *e. g.*, seed mucilages (linseed), mucilage from roots or bulbs (salep), vegetable gums, albumin, glutin, chondrin, mucin, etc.

MACHINE FOR TINNING SHEET METAL

A Remarkable Invention That Will Automatically Tin Copper or Brass on Both Sides, One Side, or Edges Only.

By L. J. Krom.

The Metal Industry for March, 1913, contained a description of the methods in vogue for the tinning of sheet copper and brass on one side only. The practice there described dated back probably to the time when they tinned the copper for the roof of Noah's ark (if they used any). In the article a statement was made that there was no machine today in use, as far as we knew, for tinning sheet metal on one side only. This statement was correct, and as a direct result of the article we are now informed by Mr. W. A. Cook, of 253 Broadway, that there is such a machine just ready to be placed in operation.

Mr. Cook is a practical brass and copper man whose long experience and wide acquaintance with mechanical men make him competent to judge of the merits of such a machine. He began his metal experience as superintendent of P. Hayden's Rolling Mill at Bloomfield, N. J., was next general sales manager of the Scovill Manufacturing Company, Waterbury, Conn., president of the Manhattan Brass Company, New York, and is at present connected with several brass manufacturing companies. Mr. Cook has secured the patent rights for the new machine and has given us some very interesting facts concerning it.

For a matter of comparison and in order to show how badly such a machine is needed we might give a few figures obtained in actual practice. One large concern that produces a small amount of tinned copper and brass per month, say 60,000 pounds, used in a year 14,885 pounds of new tin together with tin recovered from dross. The amount of dross made and sold was 11,379 pounds. The amount of tinned metal produced was 425,000 square feet. The cost of doing this work was at the rate of $5.17 per day for 3,500 square feet. This, it will be seen, makes a cost, including cost of tin, but allowing nothing for fluxing acid, cleaning, finishing and trimming (these figures are not given) of 2 cents per 100 square feet. Another mill gives figures as follows: 4,200 square feet of metal are tinned per day of ten hours at a labor cost of $9. They use 300 pounds of new tin per week and make 35 per cent. of dross. The mill makes 450,000 square feet per month. The cost per day includes acid, tin and swabbing. The necessary trimming of four sides and cleaning the sheets in cyanide is extra.

The machine controlled by Mr. Cook is absolutely automatic and will handle a continuous roll of sheet metal. It treats with acid, swabs, coats with tin, scrapes off surplus, washes and cleans at a labor cost of $4 per day. It will tin 60,000 square feet of metal with 300 pounds of tin for $4, compared with 25,000 square feet for the same amount of tin at a labor cost of $9 per day, and makes only 10 per cent. of dross! With this machine it is possible, says Mr. Cook, to turn out 100 lineal feet of tinned metal per minute. This is 6,000 feet per hour, or 60,000 feet per day, irrespective of the width of sheet.

It is possible also for this machine to tin metal on one or on two edges only as for roofing purposes. Some of the great advantages of this machine are that the metal is tinned in a continuous roll, thus doing away with trimming or squared ends and cutting down labor cost and scrap for making pits and flats. There are no edges to be trimmed and, as said before, the dross account is merely nominal, instead of from 35 to 50 per cent. as now. The cost of doing all this work is declared to be but a fraction of the present cost, and the machine costs but little to build. The Metal Industry hopes to be able to give further details and to show a picture of the entire apparatus at an early date.

DOMESTIC UTENSILS IN INDIA

[United States Consul Edward J. Norton, Bombay.]

Most of the domestic vessels used by the people of India are made of copper or brass, and departure from this usage is rendered difficult from certain ritual observances of cleanliness. Bombay is, perhaps, the chief center in India for manufactures of copper and brass, and large quantities of these products are sent to almost every part of the Presidency, near-by Provinces, and Native States. The raw product—copper and brass sheets—is cheaper here compared with other manufacturing cities removed from the sea, and there is a ready market for these goods in this growing capital. The industry is helped considerably by the immigration of the better class of workers from the rural districts.

IMPORTS OF COPPER INTO INDIA.

In connection with the copper-manufacturing industry, a brief reference to the import trade in this metal may be of interest. During the official year ending March 31, 1913, Bombay's share of the imports of copper was distributed as follows: Old metal for remanufacture, $13,353; unwrought metal, $110,703; braziers and sheets, $2,187,555; lametta, $146,452; unmixed or yellow metal for sheathing, $2,403,646; other manufactures, $155,470; amounting in all to $5,017,179.

The total imports of copper into all India during the year under review were valued at $8,998,111, so that Bombay's large share of the trade in so durable an article indicates a thriving industry. Two-thirds of the copper imported came from the United Kingdom; nearly $2,500,000 worth was purchased from Germany; Japan found a market for over half a million dollars' worth, and France was only a short way behind. Notwithstanding that the United States produces over half of the world's supply of copper, we evidently have no direct trade with India, as the value of the metal imported from the United States last year was less than $200.

Copper ore, it may be said, exists in India, but the production continues negligible. The quantity produced in 1911 was 2,238 tons, valued at $16,565.

ALUMINUM GOODS.

The great need of a cheaper substitute for brass or copper vessels has created a large demand for aluminum goods, and some of the bazaar workers are now making utensils of this metal. Aluminum ware is used also in nearly all European households. Bazaar prices for aluminum utensils are not high; some of the more popular articles are polished stew pans, which in 2-pint sizes sell for 60 cents, including covers; 4-pint sizes cost 90 cents; 9-inch frying pans retail for 60 cents; 7-inch dinner plates sell for $1.92 per dozen.

FOUNDRY AND WORKSHOP LIGHTING*

By Arthur Kitson.

The statement that the luxuries of one generation become the necessities of the next finds no better illustration than in the subject of artificial lighting. Twenty-five years ago the introduction of an electric lighting plant into a works or office was regarded as much an evidence of reckless extravagance as the purchase of a motor car ten years ago, or the ownership of a private 5,000-ton steam pleasure yacht nowadays. No doubt the high cost of such a plant twenty-five or thirty years ago warranted the public in forming that conclusion. Those were days when factory operatives had to get along with flickering fish-tail gas burners, smoky oil wick lamps and even foul smelling torches and candles. It was also a time when human life in mills and workshops was held somewhat cheaper than it is today.

Today good factory lighting is considered as much a necessity as a good supply of water or a sufficient source of motive power. Its results are not merely obvious in the superior comfort, health and eyesight of employees—overwhelmingly important as this is—but in the extra quantity and superior quality of the work produced. In other words, the proper lighting of works and rooms where millions of human beings are compelled to spend probably one-third of their whole lives has both an ethical and an economical value, and in this, as in all human affairs, in the long run it will be found that to follow the ethical rule means achieving the best economical results.

Since the various factory and insurance bills have become law, imperfect and insufficient illumination may result in severe monetary losses to factory owners and shareholders by reason of accidents to employees. "The cash value of good illumination in efficiency of employees," says a well-known engineer, "cannot be overestimated. They work better and with less strain when they have just the kind and quantity of light suited to their work. Their eyes are better, their health is better, their heads are clearer. They don't get ill so often and stay away. The output is better and there is more of it."

The field of factory lighting is practically held today by the three systems, gas, electricity and oil by means of incandescent mantles. Although the first two systems are sufficiently well known not to require any description, the third, being of a somewhat more recent origin, is not generally familiar to the average man. Perhaps a description of the third will be of interest.

In 1885, while residing in Philadelphia, the author constructed what is universally admitted to have been the first successful incandescent oil lamp. Having obtained a bunsen flame by means of vaporizing the oil at the point of combustion, and mixing this with sufficient air to produce a blue smokeless flame, it was applied to a platinum gauze mantle. The result was a remarkably brilliant white light which attracted great attention. Platinum, however, was found commercially impracticable for mantle purposes. It rapidly deteriorated under the heat and disintegrated. It was only after Welsbach had placed his invention on the market that it became possible to offer the public a thoroughly commercial incandescent oil lamp. The light was soon afterward introduced into the English lighthouses, the first installation being made at the High Lighthouse at Lowestoft, and since then under Sir Thomas Matthews, the Trinity House engineer, the Kitson system has been introduced in most of the lighthouses under his charge.

Considerable attention is now being given by government inspectors to workshop lighting, owing to the numerous accidents that have happened in the past. The three rules laid down by the chief factory inspector in a recent annual report for the proper lighting of works are:

1. The light should be adequate, having regard to the nature of the work carried on.
2. The lamps should be arranged so as to prevent "glaring" effects.
3. The lamps should be arranged so as to avoid troublesome shadows.

These rules apply, of course, to works of every description.

The lighting of foundries is one of the most difficult of all problems connected with illuminating engineering.

Owing to the black sand, the almost unavoidably black walls and roofs, foundries have to be lighted almost entirely by the direct rays. No reflecting walls and surfaces here come to the aid of the lighting engineer. And yet there are few places where a good light is more necessary. For foundry lighting, therefore, the softest and most diffusive light should be selected. The worst possible light is the ordinary electric arc lamp. Emitting from a very small center a few enormously dazzling rays, the effect is cruel to the eyesight and disastrous to good work. A good molder likes to see the fine edges and the bottoms of his molds. The intense black shadows thrown by the arc lamps render accurate work on the part of the molder very difficult. Of course, where these lamps are still used the general plan is to surround the arcs with opal, opalescent, or ground glass globes, which help to scatter the rays—although greatly at the expense of the volume of illumination. Flame arcs are in many respects superior to the ordinary arcs, although the constant flicker and variation of intensity of light is enormously trying and injurious to the eyes. Moreover, the color of these lamps is very objectionable. The high candle power electric incandescent filament lamps are certainly superior to the arc types—although more expensive. Incandescent gas lighting—especially high-pressure lighting—is generally acknowledged to be a more pleasing and more diffusive light than any electric system yet devised. But foundry lighting presents a difficulty to incandescent mantle lamps which electric lamps escape. The constant presence of foundry dust, which contains particles of iron, tends to choke up the air passages—unless special precautions are taken for supplying clean air. The iron particles also attack the thorium mantles and rapidly destroy them. For this reason, incandescent gas lighting in foundries has often failed. The breakage of mantles has also been severe, especially with the high-pressure gas, which tends to burst the mantles by the heavy gas pressure, making the lighting cost often excessive. While it is quite impossible to avoid the presence of dust in the atmosphere of foundries, a little care and extra trouble would often result in the saving of money and tend to reduce much of its injurious effects. The frequent cleaning of the lamps and walls would pay over and over again for the time taken. In many foundries the dust is allowed to collect on the lamps to such a degree that what was supposed to be a 1,000 c. p. lamp scarcely yielded more than 50 c. p. With the simple use of a brush, the lamp was restored to its full candle power inside of two minutes. Again, the walls of foundries might be frequently cleaned and even whitewashed occasionally, which would serve

*Abstract of lecture delivered at the Chemical Engineering & Foundry Trades Exhibtion, Agricultural Hall, London, June 24, 1913.

to economize the lighting costs and improve the hygienic effects.

With the incandescent oil lamps, owing to the richness of the combustible mixture which enters the mantle at practically little above atmospheric pressure, the flame temperature is very high, although the vapor pressure is low. Hence a very high efficiency in candle power with comparatively little destruction of mantles is obtained. Of course, the same precautions with regard to supplying pure air to the lamps in foundries are as necessary with the oil lamps as with gas lamps. This is achieved, as supplied by the Kitson-Empire Company's system, by a method of filtering the air, which prevents the dust particles from reaching the mantles. The incandescent oil light is recognized as remarkably diffusive. Although a single ray would be far less intense than a single ray from an electric arc lamp, emitting as it does an enormously greater number of rays, owing to the much greater area of incandescent emitting surface, the general illuminating effect is better and renders objects more apparent to the human eye. In a recent instance, four 1,000 c. p. incandescent oil lamps were supplied to a colliery company in South Wales, where they displaced eight so-called 2,000 c. p. electric arc lamps. The colliery company's employees assert that the four oil lamps render objects far more visible than the previous eight electric lamps. One of the first attempts at lighting iron foundries with incandescent oil lamps was in the north of England. One side of a foundry was fitted up with these, the other side being lighted by a similar number of electric arc lamps of nominally double the candle power. The second night of the trial, the men working under the electric lamps asked if they could not also have the oil light. When the foreman asked them the reason, they said, "Those men opposite (where the oil lamps had been installed) can see to the bottoms of their molds easily, and we can't." The order was then given to remove all the electric lamps from the foundry and install the incandescent oil lamps.

Economy naturally plays an important part in determining the choice of a particular lighting system. Where electric power plants are installed in works, directors and managers think it cheapest to use their own current for lighting purposes. This, however, depends upon circumstances. If the need for electric power is increasing so that the works are capable of utilizing the full capacity of the plant for power, then it certainly would be economy to instal a special lighting system. [On this question of lighting costs, there is much ignorance. I have heard engineers insist that the lighting of their works costs nothing. "We have to keep the electric plant running for power purposes and the extra current for lighting makes no difference." This was once said by the managing director of a great steel works in the north where they were using 300 or 400 arcs. Evidently there are existing—among the educated classes—those who still reject the law of the conservation of energy and who continue to believe in the principle of perpetual motion. This man seemed to think that the consumption of an extra 200 horse-power per hour made no difference to the coal consumption, that the extra wear and tear of machinery cost nothing, that electric lamps needed no attention, no labor, no repairs, and that nothing need be charged for interest on capital! Truly a new system of creation! Because these costs are hidden, or included in power charges, directors and managers are often blissfully ignorant of what is being paid for artificial illumination.]

VIEW TAKEN IN A BIRMINGHAM FOUNDRY LIGHTED BY THE KITSON-EMPIRE LIGHTING COMPANY, LTD.

Referring to the cost of incandescent oil lighting, this naturally varies with the price of oil. The author has known oil lighting to work out at less than one-third of 1d. per 1,000 c. p. per hour, including cost of oil, mantles and labor. At the present time, with oil at from 6d. to 7d. per gallon, it amounts to somewhere between ½d. and ¾d. per 1,000 c. p. per hour. [This, I submit, is as cheap, if not cheaper, than any other system of artificial lighting.]

A circumstance may here be mentioned which has tended to assist the extension of both electric and gas lighting and which has been denied to the incandescent oil system. Enormous amounts of capital have been invested in electric and gas plants and inventors of electric

and gas lamps have had the active co-operation of all those companies in furnishing a market for their inventions. On the other hand, the inventor in the field of oil lighting has had to labor single-handed. Very few oil companies have deigned to assist him in opening up a market or in bringing his inventions to the public notice. He has had to struggle alone, using his own capital and fighting unaided his powerful rivals. Had these companies shown one-half of the enterprise displayed by the gas and electric companies, there would have been found in incandescent oil lighting a far more formidable opponent than heretofore.

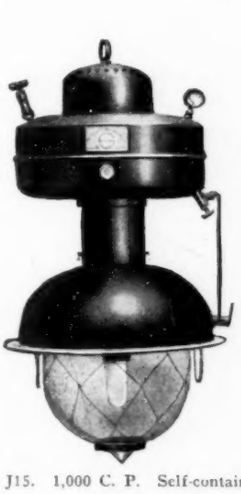
A study of the principle embodied in incandenscent oil lighting will show why this light is so extraordinarily efficient. There is practically no waste in the transformation of the oil to its final combustion. Its products are steam and carbonic acid. The products or combustion are as perfect in this lamp as probably in any that has yet been produced. The author frequently made the experiment of holding a porcelain disc over a lamp for hours and has never found the slightest discoloration from soot or free carbon. In this respect it fulfils all the rules laid down by the principles of hygiene, and a certificate from the Institute of Hygiene to this effect has recently been granted to the Kitson system.

In the conversion of oil into vapor, there was originally a certain loss in the deposit of carbon. Much of this loss depends upon the time taken for the vaporizing process. If, for instance, the oil is heated from the atmospheric temperature and conducted through a very considerable length of tubing until it escapes at a temperature of 600 to 700 degs. F., the deposit of carbon will be very slight indeed, and in the latest types of lamps which are known as the inverted types, as illustrated above, the deposit of free carbon is almost negligible. It follows, therefore, that by this system one is able to secure the maximum of efficiency from a given quantity of oil.

In regard to the technical difficulties that have been experienced with incandescent oil lighting, I may mention the two chief ones have been the time required to light the lamps, and the clogging in the small needle hole through which the vapor escapes. These, however, have recently been practically overcome after some years of experimenting. Each lamp is practically a small gas works, containing a retort in which the oil is converted into vapor. From there it passes to a very fine needle hole, where it is discharged into an opening, or tube of special diameter, and escaping into this tube it mixes with sufficient air to enable it to burn on the bunsen plan with a blue flame, giving a very intense heat, from which the mantle is raised to incandescence. The lamp is exceedingly simple in principle and when properly constructed there is not much to get out of order. The following illustrations show two or three of these incandescent oil lamps. These types are those now supplied by The Kitson-Empire Lighting Company, Ltd., of Stamford, under their patents.

The type known as J15 represents a 1,000 c. p. self-contained inverted lamp. The J12 is a similar lamp, but smaller, being 500 c. p., inverted, self-contained.

The E42 lamp is a type of foundry lamp supplied by this company on the system principle. In the self-contained type, the oil tank will be seen as fitting round the top of the chimney. Where these lamps are used on the system principle these tanks, of course, are not required. The lamps are the same in construction, but without these collar tanks. One central reservoir takes the place of these self-contained tanks and the oil is conducted through small tubes to the lamps. A view is also given of one of the Birmingham iron foundries, which is equipped with our system. This photograph was taken under the light with about 30 minutes exposure.



Type J15. 1,000 C. P. Self-contained.

Type J12. 500 C. P. Self-contained.

Type E42.

SOME OF THE KITSON-EMPIRE LIGHTING COMPANY'S, LTD., KEROSENE OIL INCANDESCENT LAMPS.

There has recently been designed a special method of lighting up two or more of these lamps from one central point at one and the same time, and this operation is now simplified so that it is not more difficult than lighting so many gas lamps.

In conclusion, while the choice of lighting systems is often a matter of prejudice, sometimes depending upon the friendship of a works manager or director with someone interested in a particular lighting system, or where a firm has some interest in a particular lighting company, the question of which is the best light for all purposes can generally be determined by actual experiments, and most lighting companies are now prepared to place a small installation on approval.

Of course, improvements in all these systems will be made from time to time and it would be very unwise for anyone to attempt to predict what may be the future of artificial lighting or what system may prove the most superior during the next few years. One may, however, look with confidence for further developments in the near future.

THE CORROSION OF CONDENSER TUBES*

SOME INVESTIGATIONS RELATING TO THE CAUSES OF AND CURE FOR CORROSION OF SEAMLESS BRASS TUBING.

BY GUY D. BENGOUGH, M. A., D. Sc.,† AND RICHARD M. JONES, M. Sc.

RESULTS OF THE EXAMINATION OF THE TUBES.

ADMIRALTY TUBES, 70:29:1.

Top tube.—Dezincification in irregularly-shaped spots and areas, mainly along the bottom and sides of the tube, but extending for about 8 inches on each side of the center.

Middle tube.—Dezincification mainly along one side of the tube. Extends for about 6 inches from center.

Bottom tube.—No signs of dezincification.

SPECIAL BRASS, 70:28:2.

Top tube.—Dezincification at sides only. Not very pronounced. Mostly near center of tube.

Middle tube.—A few scattered dezincified spots only. Distribution around tube irregular. Mostly near middle.

Bottom tube.—No signs of dezincification.

BRASS, 70:30.

Top tube.—Dezincification in spots along bottom and sides of tube, extending a considerable distance from the center.

Middle tube.—In spots, mainly along bottom of tube. Interior surface of tube uneven and dezincification appears to take place on the raised portions.

Bottom tube.—A large dezincified area at top of tube, near center. Dezincification extends a few inches from center of tube.

MUNTZ METAL, 69:31.

Top tube.—Severe dezincification in spots. In some places dezincification has almost penetrated through the tube. Especially noticeable along sides of tube. Most severe near center.

Middle tube.—Numerous dezincified spots. One large area, 2 inches from center. Dezincification has penetrated one-third through the tube in one or two places.

Bottom tube.—A few small spots at top of tube.

Note.—The formation of a pit appears to take place in the following way. The zinc is removed from certain spots in the tube and leaves behind the copper in a loose, spongy, and rotten form. When dezincification has penetrated right through the tube, and the copper has lost its backing of unaltered brass, it is quickly worn away mechanically. Mechanical, and to a certain extent chemical, action also removes some of the copper even before dezincification has penetrated right through the tube. This is shown by the measurements of the depths to which the coppery area is depressed below the general level of the surface.

The most important deductions which the authors consider may be drawn from this series of observations are:

1. The Order in which the Tubes resist Dezincification.—The most resistant were the 70:29:1 and the 70:28:2 tubes. These appear to resist the action to about the same extent, and were considerably more resistant than the 70:30 brass, which came next in order of merit. The Muntz metal tubes were decidedly the most quickly attacked.

2. The Importance of Temperature in Corrosion Phenomena.—In all cases the attack appeared to be most severe at or near the centers of the tubes. Since the steam entered the condensers at the center and no baffle-plates were used, the tubes must have been subjected to the highest temperatures at their centers. It becomes evident, therefore, that temperature plays a most important part in determining the distribution of the areas of dezincification.

3. Corrosion is not Confined to the Bottom of the Tubes.—It usually occurs in that position, but is by no means confined to it. It frequently occurs along the sides, and occasionally along the tops of the tubes.

4. Graphite Particles cannot be regarded as a cause of Dezincification.—Dezincification can occur independently of the presence of these or any other foreign particles.

GENERAL SUMMARY OF EXPERIMENTAL WORK.

All the conclusions tabulated below are based on experiments carried out with natural sea water and ordinary condenser tubes of commerce.

1. The alloys examined corroded in two distinctly different ways, one of which is characteristic of ordinary atmospheric temperatures—termed "complete corrosion," and the other of temperatures slightly elevated—termed "selective corrosion."

2. Selective corrosion, which results in dezincification and pitting, and is therefore the cause of the practical problem, must be regarded as an inherent property of the alloys examined, provided that sea water and the requisite temperature conditions are present.

3. The influences of a number of the deposits and particles hitherto supposed to be the causes of dezincification have been shown to be unimportant.

4. The influence of the juxtaposition of two phases in the alloys examined was found to be unimportant.

5. The order in which the alloys resisted complete corrosion was different from that in which they resisted selective corrosion. Hence the resistance to selective corrosion cannot be deduced from observations on the resistance to complete corrosion at the ordinary temperature.

6. The results of the experiments with the model condenser plant confirmed the results obtained in the laboratory experiments.

7. Preliminary observations have been made upon the mode of action of electro-chemical protection, and attention has been directed to the deposition of calcium carbonate scale on protected tubes.

SOME OBSERVATIONS ON THE PRACTICAL PROBLEM.

It has become clear from the experimental work previously described that dezincification followed by pitting is a phenomenon inherent in brass alloys of the type discussed.

The conditions for its appearance are the presence of certain kinds of water, of which natural sea water is one, and of a certain temperature. The physical state of the surface of the alloy may have some influence in determining the exact points at which the action starts, but merely assists a tendency which is characteristic of the alloy. The action once started will spread throughout the alloy.

Dezincification may be prevented, or at least postponed, by four different means:

1. By using a suitable water supply.
2. By using an alloy different from brass.
3. By adjustment of the temperature conditions when brass is used.
4. By electro-chemical protection.

In the mercantile marine Method 1 can never be em-

*An abstract from the Second Report of the Corrosion Committee of the Institute of Metals. Presented at the Ghent, Belgium, meeting of the Institute of Metals, August 27-29, 1913.

†Lecturer in Metallurgy in the University of Liverpool.

ployed, and it can rarely be used even in land installation. Moreover, there is, as yet, no precise information as to the kinds of water which will not give rise to dezincification.

As regards Method 2, very little information is at present available. An obvious suggestion is to lower the amount of zinc present in the alloy, and thus to diminish the tendency toward dezincification. As to how far, if at all, the elimination of zinc could be usefully carried, the authors cannot make any definite statement. It is however, certain that a complete removal of zinc would give rise to serious trouble of another kind. Possibly there may be some alloy intermediate between 70:30 brass and pure copper which would be more resistable to corrosion than either, though whether it could be satisfactorily drawn into tubes is another matter. Probably manufacturers have already experimented privately along these lines, and information on the subject would be welcomed.

A number of alloys which contain no zinc suggest themselves as suitable for the manufacture of condenser tubes. Phosphor-bronze has been proposed on a number of occasions. It can be drawn into tubes of good quality, and at first sight would appear to be an excellent material for the purpose. Under certain conditions, however, it appears to be subject to a peculiar and deeply penetrating form of complete corrosion, the cause of which has not yet been ascertained by the authors, and the phenomenon of "detinning" has also been observed. More work upon this alloy is desirable before it can be recommended for use.

A copper-nickel alloy produced on a large scale in America and known as "monel metal," has been used for condenser tubes. It appears to give satisfactory results as far as resistance to corrosion is concerned, but its high price has prevented its extended use.

The work of Carpenter and Edwards would suggest the use of a copper-aluminum alloy if it could be easily and cheaply drawn into tubes, but the authors have never had an opportunity of experimenting with tubes of such material.

As regards the immediate future, and pending future investigations on different types of alloy, the best means at the disposal of engineers for hindering corrosion appear to be:

1. The entire abandonment of the use of plain 70:30 brass, and its replacement by either the Admiralty alloy, 70:29:1 (tin), or Muntz's special brass, 70:28:2 (lead).
2. Careful control of the temperature in condensers.
3. The extended use of electro-chemical protection.

As regards 1, ample evidence will be found in the experimental section of this report, and the matter needs no further emphasis here.

As regards 2, the authors consider that the importance of temperature in determining the nature of the corrosive attack on brass by sea water has not received from engineers the attention it deserves.

In practice the most important factor which influences the temperature in a condenser is the amount of steam admitted to it. This may be conveniently stated as the number of pounds of steam condensed per hour per square foot of tube area. Inquiries have been made by the author as to the average amount condensed in ordinary practice, but they find that engineers are rarely able to state the amount, though they can usually state the amount of steam the condenser was originally constructed to deal with—a somewhat different matter.

In the author's work with the experimental condenser the temperature of the outlet water rose to 40 deg. C. in hot weather, when only 5 lb. of steam were being condensed per square foot of tube surface. The temperature of the hottest part of the tube rose under the same circumstances to 55 deg. C. Even in cold weather the temperature of the hottest part of the tube approached 40 deg. C., which is in the danger zone. The temperature of the outlet water was then almost 25 deg. C.

The temperature of the water in a condenser can be kept down in the following ways:

1. By limiting the amount of steam condensed.
2. By shortening the path of the water through the condenser.
3. By increasing the speed of the water.
4. By preventing choking of the tubes, either by fitting screens or filters, or by frequent cleaning.

As regards 1, the amount of steam condensed has been considered hitherto from the point of view of engine-efficiency and space-economy, and not at all from the corrosion standpoint. Nevertheless, it is a fact that, within the practical limits of temperature,* the greater the amount of steam condensed the greater will be the tendency to selective corrosion, and if the condenser be really overloaded this form of corrosion may be extremely rapid.

The effect of temperature has been completely masked in recent years because of the peculiar distribution of temperatures in condensers arising from the use of baffle-plates. When these are used the hottest part of a tube is not necessarily the middle of its length, but may be almost any part between the middle and the last foot or two. Its position will be determined by the size of the baffle-plates and the velocity of the steam entering the condenser.

As regards 2, the practice of dividing a condenser into two "nests" is a distinct aid to corrosion. As the water passes through the lower nest it becomes heated, and consequently the top nest is supplied with water that is already warm and which will become still more highly heated. From the corrosion point of view it would be preferable to introduce a separate water inlet and outlet to each nest of the condenser, and to discontinue the practice of building them in nests (especially since the condensing efficiency of the tubes in the lower nest is small).

As regards 3, inquiries have shown that the speeds of water through the condensers in the mercantile marine vary between 240 and 360 feet per minute. The average for all the figures obtained is about 290 feet per minute. The speed of the water used in the experimental plant was about 275 feet per minute. The faster the speed of the water in the condenser the lower the temperature, other things being equal, and the less the liability to the choking of tubes. In the authors' opinion the speed should be kept up at least to the highest figure mentioned above, and it might be worth while to try still higher speeds.

Inquiries made by the authors have shown that choked tubes are sometimes severely corroded, and sometimes not at all. If a choked tube be found in the bottom part of the condenser working normally it will not usually be corroded, since its temperature, even in this case, is still low; if, however, the condenser is being overloaded, as shown by the high temperature of the outlet water, it may be severely corroded. If a choked tube be found in the top part, however, it will usually show severe dezincification, owing to the high temperature to which it has been heated. Hitherto the corrosion of choked tubes has been attributed to the electro-chemical action of particles, more particularly of carbon, but this view has now been clearly shown to be untenable.

*It is probable that at high temperatures the speed of selective corrosion falls off again, and finally becomes zero, but these temperatures are almost certainly too high for effective steam condensation to take place.

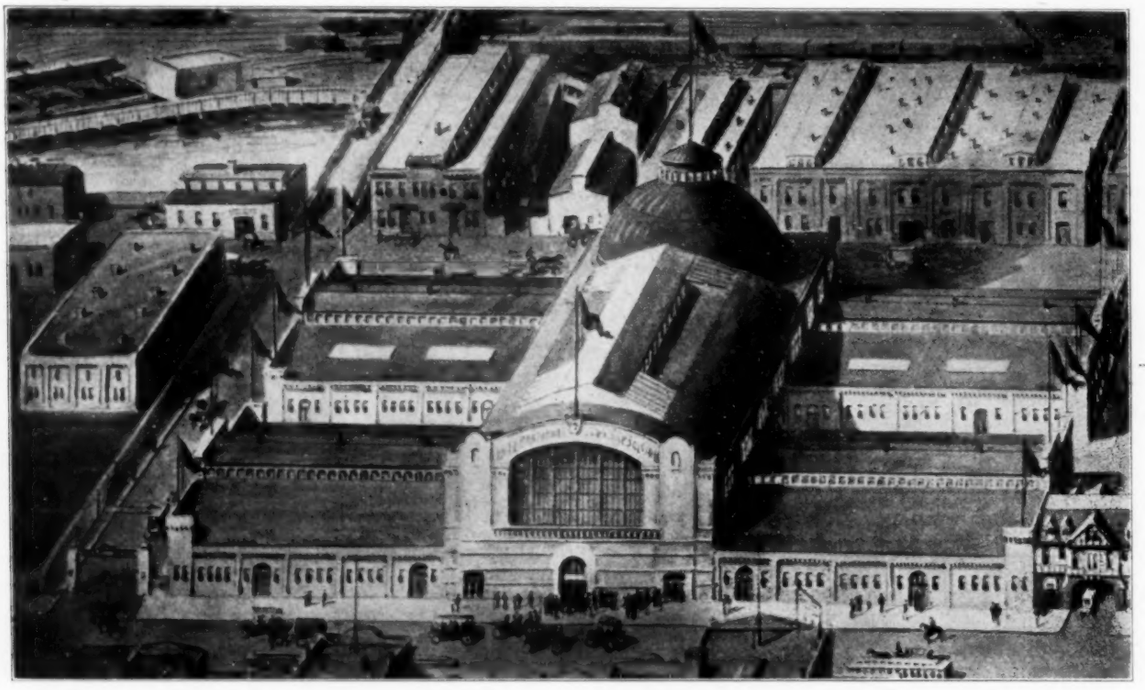
THE CHICAGO EXHIBITION AND FOUNDRY CONVENTIONS

A Description of the Preparations Being Made for the Holding of the Most Important Event of the Year for the Metal Industry.

By J. H. Hansjosten.

The finishing touches are being put to the arrangements for the exhibition to be held in connection with the convention of the Brass Founders, at the International Amphitheater, Forty-second and Halstead streets, Chicago, October 10 to 17. While every exhibition of The Foundry and Machine Exhibition Company has been greater and larger than the previous one, the 1913 exhibition will eclipse all past ones, both in magnitude and in variety, for while up to a few years ago, the exhibits were largely of foundry equipment, this year practically every department of a modern manufacturing plant will be interested, for the exhibits will consist of machine shop, foundry, pattern shop, plating department, power factory buildings. There are no basements, all floors being on the ground level, and of cement, wood or dirt construction. There is a straight run of 525 feet of railway track, making it possible for exhibitors to place carload shipments right in the building. A force of electricians, carpenters, steam fitters, plumbers, and laborers will be on hand, making it possible for exhibitors to install and prepare their exhibits at the lowest possible expense.

The coming exhibit will be "the" operating exhibit, for up to date fully 90 per cent. of those who have taken space will require power. Both alternating and direct current can be had, while the building will be piped for



AMPHITHEATER, CHICAGO, ILL., WHERE THE FOUNDRY MACHINE AND EXHIBITION COMPANY WILL HOLD ITS EXHIBITION IN CONNECTION WITH THE ALLIED FOUNDRYMEN'S CONVENTION, OCTOBER 10-17, 1913.

department and general manufacturing supplies and equipment.

The exhibition will be held in The International Amphitheater, the largest permanent exhibition building in the United States. It is located on South Halstead street, from Forty-second street to Forty-third street, in the stock yards district. It is within 20 minutes' ride from the downtown district, and is easily accessible from the "Loop." Six surface car lines and the Stock Yards Branch of the Elevated Railway run direct to the Exhibition Building, while those wishing to reach the exhibit by automobile can take any north and south boulevard to Forty-third street, which is a splendid street for automobiles, and then drive direct to the exhibit. The amphitheater is an ideal building for an exhibit of this kind. As arranged for the coming exhibition, there will be over 75,000 square feet of floor space for exhibition purposes, exclusive of aisles. It is as well adapted for installing and operating the heaviest machinery as most compressed air, and gas and steam can be had by those who desire them. Present indications all point to a larger attendance than at any previous exhibition, while the attendance of the various conventions of foundry men promises, owing to the central location of the convention city, to be much larger than at any past events. The committees in charge of the work of preparing for the reception and entertainment of the visitors are very busy on working out the details of the program. The reception committee is making special arrangements with the hotels so that all will be provided with suitable accommodations. The entertainment committee is also very busy, and has some novel features in preparation.

Up to date, a tentative program for the convention is adopted. This includes, among other things, the registration of visitors at the Hotel La Salle, beginning on Monday, October 13. On Tuesday morning the visitors will be welcomed by Mayor Harrison, followed by responses by the visitors. Following this, the professional

sessions of the various associations will commence, at which a number of papers of general interest will be read. On Tuesday afternoon the American Foundrymen's Association and the American Institute of Metals will commence their individual sessions, which will continue until Thursday evening. Wednesday afternoon will be devoted to entertainment, and arrangements have been made for a trip to the North Side, with luncheon at the Bismarck Garden. On Thursday evening the annual joint banquet of the American Foundrymen's Association, the American Institute of Metals, and Associated Foundry Foremen will take place. An unusual program is prepared for this event, and the dinner will be unique, for there will be no set speeches, but special entertainment features will take the place of them.

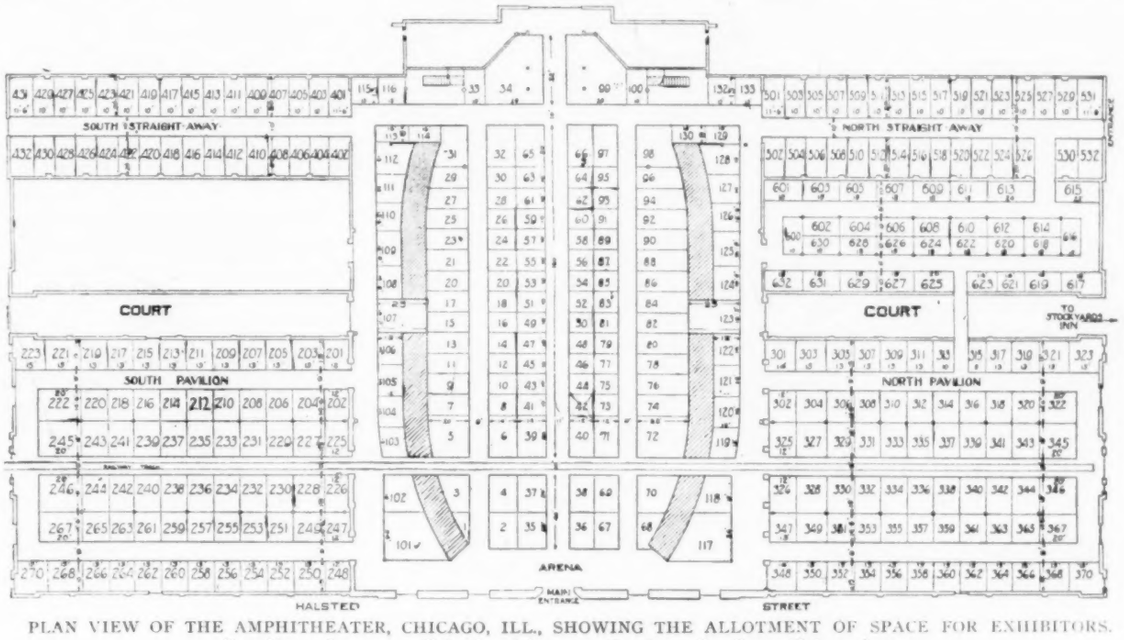
The committee is paying special attention to the ladies, and a special program is being provided for them. This will include a luncheon at Marshall Field's on Wednesday, October 15, to be followed by a matinee. On Thursday evening while the gentlemen are at the banquet, the ladies will be entertained at the Auditorium, where the attraction will be "The Whip."

of plating supplies and machinery will have working exhibits in operation, there is sure to be a large attendance of platers. There is a strong feeling among the Chicago members of this society that the annual convention of the platers society should be held at the same time and place as the allied foundry societies. This matter will also be discussed, and no doubt a movement will be started to bring this about.

At this writing, all plans for the exhibition are completed, and it is a certainty that all exhibits will be in place, and the exhibition will open promptly on Friday, October 10, and the details of the program for the various conventions are rapidly being worked out, and the most optimistic hopes are entertained for the success of this, the greatest event in the history of the metal industry.

OSTERMANN METALLIZING PROCESS.

Some interesting experiments have been carried out in Glasgow with the Ostermann system of "metallizing" all kinds of materials. The plant was installed in the



PLAN VIEW OF THE AMPHITHEATER, CHICAGO, ILL., SHOWING THE ALLOTMENT OF SPACE FOR EXHIBITORS.
THE METAL INDUSTRY will be found in space 42, where all callers will be welcome.

The following are the members of the local committees:

General Committee: Charles A. Plamondon, chairman; David R. Forgan, treasurer; H. Cole Estep, secretary; J. A. Galligan, Charles B. Carter, William Francis and O. J. Abell.

Finance Committee: J. A. Galligan, chairman; A. N. Hayes, Geo. W. Pyott, H. N. Wade, David Evans and E. J. Welch.

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Reception Committee: William Francis, chairman; E. L. Cleveland, H. O. Lange, G. S. Burtis, J. P. O'Neil, W. G. Greenlee, L. S. Rice, Thomas Jones and Irwin McDowell.

Publicity Committee: O. J. Abell, chairman; A. O. Sonne, H. L. Hawson, Richmond Nicholas and Alexander B. Hawes.

G. M. Spangler, manager of the Convention Bureau of the Chicago Association of Commerce, is acting with the general committee, and his services are greatly appreciated by the members of that committee.

At the next meeting of the Chicago branch of the American Electro-Platers' Society, the matter of attending the exhibition will be taken up, and as manufacturers

works of Stewards & Lloyds, and during the experiments a considerable number and variety of articles in metal, glass, paper, wood, and stone were coated with metal, so that when the articles were bent or hammered, the coating showed no signs of bursting or peeling. Zinc, lead, tin, aluminum, copper, bronze, nickel, or alloys of any of them are forced in an atomized condition from the nozzle of the machine employed upon the surface under treatment.

It is claimed for the system that it can be applied to many purposes for which galvanizing is unsuitable, especially to the coating of ship's bottoms and other large steel structures; that it can be used also for coating very light materials, such as the woven fabrics of aeroplanes or airships, and that it affords a guaranty against corrosion. Although new in this country, the system, it is said, has found considerable favor in Germany, where a large number of installations have been ordered by the government for use in warship work.—London Times Engineering Supplement.

HOW A BRASS MANUFACTURING FIRM CUT ITS EXPENSE ON GRINDING ONE LINE OF TOOLS

By P. W. Blair.*

In the manufacture of plumbing, steam, gas and water brass goods, undercut or forming tools have rapidly taken the place of all other methods for the production of this line of goods in their manufacture. One of the large firms in the Middle West, manufacturing the above line of goods have adopted a standard system for grinding these tools, and have had same in effect for one year, and at a rough estimate have saved over one thousand dollars in time and material since same went into effect.

Figure 1 shows cut of style of tools and chart in use for grinding same. Fig. 2, specimens of different work tools are used on.

There are at the present time nine hundred and fifty

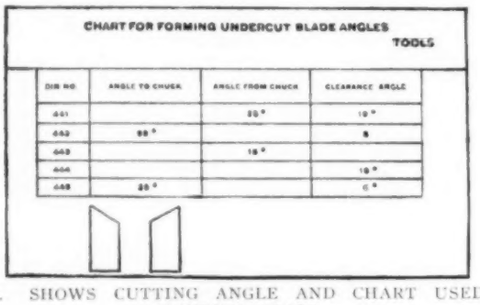

FIG. 1. SHOWS CUTTING ANGLE AND CHART USED FOR GRINDING TOOLS.

different styles of the above tools carried in the tool storage department, and a workman receives two of same when he begins operations on each job assigned to that part, which avoid any delay when he desires to replace dull tool for sharp one, and allows same to be ground by tool grinder in place of the operator of the machine. These tools are manufactured of the best grade of tool steel and are very expensive, owing to their intricate design and high quality of work they produce.

Before a system or standard was adopted each and

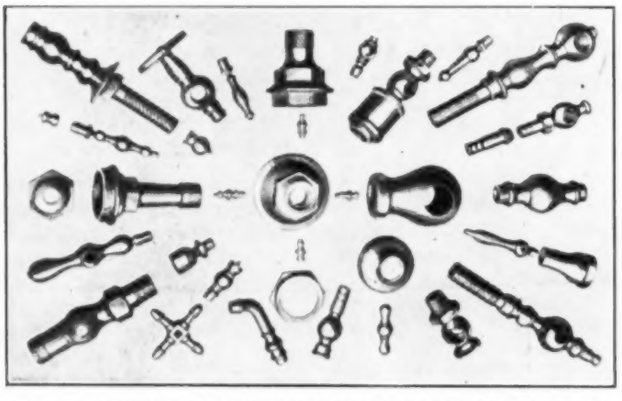

FIG. 2. SHOWING SPECIMENS OF WORK TOOLS ARE USED ON.

every individual workman ground the undercut forming tools when he used same. One workman claimed by using the blade at 30° angle he got better results than at 25° and vice versa, also there was difference on the relief. One workman would grind 5° relief and another 10° where there were six tools of the same design in the bin in the tool storage it was found that some of same were ground different angles in place of 25° to the right, they would be 25° to the left. Owing to the heavy expense of these blades and waste of material in grinding same, it was decided that something would have to be done to overcome this waste of time and money, so each tool was gone over individually and a chart was made up, showing angle and clearance each blade should have, and bulletin was posted, stating that no operator was expected to grind the above tools unless there was only one of said tools in tool storage department.

It was decided that each workman would be furnished with two tools when he started on each job, and when became dull it was to be sent to the tool grinding department and sharpened, replacing with sharp one at the machine. Should any workman find out that his tool did not work properly he was to notify his foreman and a test would be made with the tool at a different angle, until the desired results were obtained. A notice is then sent, signed by the foreman, to the tool record department notifying same on a regular form, to change angle from what has proved satisfactory. They then alter tool grinder's chart and file form away for future reference. The first three months there was quite a number of changes made on the angles as same was expected until the system got fairly started. Since then it has got to be so that there have been no changes made in the last three months and everything is working satisfactorily and good results are being obtained both by the employers and employees.

*Foreman Finishing Department H. Mueller Manufacturing Company, Sarnia, Ontario.

TRADE PAPER PROBLEMS.

The important part played by the so-called "Trade Papers" in commercial life is often under-estimated. An interesting glance at the functions of the trade paper was given in a recent address by S. H. Ditchett, editor of the Dry Goods Economist.

"In his way the trade paper publisher has difficulties away beyond those of the daily paper and immensely beyond those of the magazine," said Mr. Ditchett. "For the trade paper is talking to thousands of practical, hard-headed business men, and it deals with subjects which those men—if the trade paper is not thoroughly on to its job—will know a vast deal more about than the trade paper does.

THE TRADE PAPER MUST HELP.

"The majority of publications are issued not to tell how, but to interest—it may be, to pass an idle hour. But the trade paper is interesting only in so far as it can tell how. It has got to help its readers. And to keep ahead of those readers it has got to keep everlastingly studying their problems.

ACCURACY THE PRIME ESSENTIAL.

"Another thing: the statements made in a daily paper, or in a magazine, are quickly forgotten by the reader. Few daily papers aim at strict accuracy. They admit that the haste with which their matter is prepared and put into printed form makes absolute accuracy impossible.

"But in the trade paper accuracy is the one great, vital essential. Not only are your readers in a position to find you out if you're wrong. They can't take your advice or accept your information, without running a serious risk—very often, a big money risk. For if the trade paper is a guide at all, it is a guide in the purchase of products—it may be merchandise for re-selling, or it may be plant equipment.

EDITORIAL

OLD SERIES. Vol. 19. No. 9. NEW YORK, SEPTEMBER, 1913. NEW SERIES. Vol. 11. No. 9.

THE METAL INDUSTRY

With Which are Incorporated
THE ALUMINUM WORLD
THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

Published Monthly by
THE METAL INDUSTRY PUBLISHING COMPANY (Incorporated)

PALMER H. LANGDON - - - - - - - President and Treasurer
FREDERICK F. BURGIN - - - - - - - - - Vice-President
JOHN B. WOODWARD - - - - - - - - - - Secretary

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Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

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TELEPHONE NUMBER, JOHN 689 CABLE ADDRESS, METALUSTRY

CONTENTS

	Page.
The Use of Metals in Large Engineering Projects	371
Hot and Cold Method of Oxidizing Sheet Steel	375
Copper—Its Uses in Large Electrical Works	376
A Plater's Story	378
The Determination of Oxygen in Copper and Brass	379
The Electrodeposition of Nickel (Concluded)	380
Machine for Tinning Metal	382
Foundry and Workshop Lighting	383
The Corrosion of Condenser Tubes	386
The Chicago Exhibition and Foundry Conventions	388
How a Brass Manufacturing Firm Cut Its Expenses on Grinding One Line of Tools	390
Editorials:	
The Chicago Convention	391
American Electro-Platers' Society	392
New Books:	
The Principles of Applied Electro-Chemistry	392
Transactions of the American Institute of Metals	392
Correspondence:	
The Silver Solution	393
Nickel Plating	393
Voltmeter vs. Ammeter	393
Silver and Its Properties	394
Shop Problems	394
Patents	397
Equipment:	
Baird Burnishing Machine	399
The Allen Water Tumbler and Burnishing Barrels	399
New Automatic Feed Press	400
Dixon Dustless Polishing Bench	400
New Electric Cleaner	400
Electric Arc Welding Apparatus	401
Stilz Oil Burner	401
Associations and Societies	402
Personals	403
Trade News	403
Metal Market Review	410
Metal Prices	411

THE CHICAGO CONVENTION

This issue of THE METAL INDUSTRY contains some interesting information up-to-the-minute regarding the great event of the year for the metal industry. This convention of foundrymen's societies (four of them) and the exhibition of foundry machinery and supplies will be held this year in Chicago, Ill., October 10-17, and NOW is the time for calendars and desk pads to be marked so that every one in any way connected or interested in the founding and finishing of metals will not overlook his most important duty of the year; to visit the exhibition.

A notable feature of the exhibition this year will be the showing of machine tools, a number of builders having already secured space. This completes the chain between the operations of the foundry and machine shop and makes it possible for the manufacturer to follow out the course of production of his wares from raw material to a finished article. This can be done at the exhibition and in the BEST WAY POSSIBLE at the LEAST EXPENSE, for all of the NEWEST, MOST NOVEL and up-to-date methods, processes and machines will be exhibited.

The success of the exhibition now seems to be assured. Over 140 exhibitors have so far been secured and practically every line of machinery and equipment is well represented. There is now less than 11,000 square feet of space left for late comers, many of whom are just beginning to realize that this is to be the greatest exhibit of general shop equipment ever made.

Of the convention which is held at the same time as the exhibition little need be said. The taste of former conventions is still in the mouths of delegates and visitors and we are sure that every one who went to Cincinnati, Detroit, Pittsburgh or Buffalo will want more of the same food. A glance at the list of papers promised for Chicago by the Committee on papers of the American Institute of Metals (see Associations and Societies column of this issue of THE METAL INDUSTRY) certainly assures that every one will find something to interest him. Some of these papers will undoubtedly be distributed before October 13 so that discussion may be prepared in advance and this is what makes the meetings interesting. So let every one who has some problem to work out report it to Secretary Corse or tell about it at the sessions and thus add to the store of knowledge and be helped while helping others.

The discussion to be started by C. W. Burgess on the Nomenclature of Non-Ferrous Metals promises to be particularly interesting, and it is to be hoped that members will attend the meeting with plenty of ideas and suggestions that may be adopted and thus settle a puzzling question of long standing.

AMERICAN ELECTRO-PLATERS' SOCIETY

The new constitution adopted by the American Electro-platers' Society has just been published and is a commendable work for which its framers are to be congratulated. A difficult proposition has been handled in a most satisfactory manner and we believe that the test of time will not demand many changes. There is one portion of it, however, that we should like to see undergo some revision and this is in the classification of membership. We have spoken our mind on this point before, so that this idea is not new. We have reference to the broadening of the scope of the "Society" as it now is so that deserving and ambitious platers' assistants may become members and thus get the advantages of such membership in order to fit themselves for foremen platerships.

At the plating symposium, held by the American Electro-Chemical Society in Atlantic City, April 3-5, 1913, there were a number of speeches made by members of the Electro-Platers' Society in which sentiments were expressed that the scientific schools should teach electro-plating, particularly the chemical end of it. This is all very well and a most excellent idea, but will it not turn out electro-chemists with a knowledge of practical electro-plating and would not such men be then capable of supervising the entire electro-chemical and chemical work of a large industry? Would they not be capable of DIRECTING the work of not only the chemical laboratory, the research department and also the plating departments? Would there not still be required men of practical training to be in charge of departments under the DIRECTION of the scientifically trained man? Men who had to come up from the ranks through force of circumstances over which they had no control and no fault of their own and who would be paid a salary commensurate with the work performed, but less than that which would attract the scientific man? These are the men who would be the real foremen platers, hundreds of whom are now in the making but who cannot hope for college or university aid. It is true there are night schools, etc., but the man who has worked all day does not as a rule make a good student and if he does, would not he be greatly aided if he could at the same time have access to the literature of AN EDUCATIONAL SOCIETY devoted to his own chosen field?

We are pleased to note in the new constitution that exchanges with other societies can be authorized by the Executive Committee; also that abstracts from the publications of the society can be made in the interest of the science of electro-plating. We note, too, that certain articles or papers may be released at the pleasure of the Executive Committee. This is as it should be and we hope the Executive Committee will find it expedient to grant this privilege freely as such publication cannot fail to help increase the membership. Future members after sampling the quality of one or two articles will soon show a desire for more and thus be attracted to the source of such matter and become members.

There is another matter to which we would like to draw the attention of the Electro-Platers' Society, and while we confess the thought is not entirely our own, we think the point is well taken and we would urge its adoption. A committee has been appointed by the Society to co-operate with one appointed by the American Electro-Chemical Society for the purpose of standardizing plating methods and solutions. Here is the borrowed thought:

"In thought and application the representatives of the two societies are as far apart as the earth and sun and unless there be someone found whose line of work lies between the strictly theoretical and the strictly practical the work of the committee will be of little value. Therefore it should be the duty of the American Electro-Platers' Society to add to their committee at least two men who are both electro-chemists and practical platers. These men may be found among their own members and it is an absolute certainty that they would greatly aid the work and something tangible would result from their efforts. Anyone who was present at the Atlantic City meeting could not but be convinced that the plater and chemist has no common ground on which to meet and cannot understand each other's language."

A perusal of the proceedings of the twenty-third annual meeting of the American Electro-Chemical Society will amply bear out the soundness of the above argument.

NEW BOOKS

"THE PRINCIPLES OF APPLIED ELECTRO-CHEMISTRY." By A. J. Allmand, 1912. Size 6½ x 8¾ inches. 548 pages including index. 136 illustrations. Bound in cloth. Published by Longmans, Green & Co., New York. Price $5. For sale by THE METAL INDUSTRY.

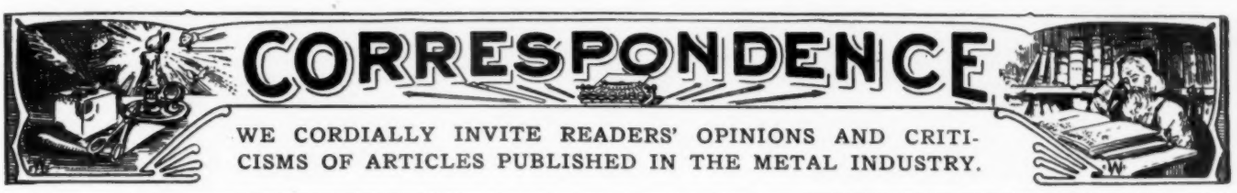
This volume is designed for both technical men and students and the subject has been treated primarily from the standpoint and the theory of the principles involved, as through their thorough comprehension the best results may be obtained in practice. The book is divided into two sections. Assuming an elementary knowledge of chemistry and electricity, Part I. is chiefly concerned with the treatment of the fundamental phenomena and theory of the electro-chemistry of aqueous solutions. Particular stress is laid on irreversible effects, which though of very great importance in technical electro-chemistry, seldom receive the attention they deserve. Part II. treats separately of the various technical processes used, discussing primary and secondary cells. The entire work consists of twenty-eight chapters. In Part II. some particularly interesting information is given relating to the electro-chemistry and electro-metallurgy of copper, silver, gold, zinc, tin, nickel, etc. Chapter nineteen devotes nine pages to the electro-chemistry of electrotyping and electroplating. We have no doubt but that this book will be a welcome edition to the electro-plater's and electro-chemist's library.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF METALS. Volume 6. 1912. Size, 6¼ x 9 inches. 250 pages and index. Bound in cloth. Published by the Institute of Metals. Edited by W. M. Corse, secretary.

This book contains the proceedings of the sixth annual meeting of the American Institute of Metals, held at Buffalo, N. Y., September 24 to 27, 1912. A valuable feature of the work consists in the including of Bulletins 10 to 19, which have been published from time to time during the year by the society and which contain abstracts of metallurgical literature and patents. A list of the members of the institute is also included.

AMERICAN SOCIETY FOR TESTING MATERIALS INDEX—PROCEEDINGS VOLS. I-XII.—1898-1912. Size 6¼ x 9¼ inches. 158 pages. Bound in cloth. Published by the Society. Edited by Edgar Marburg, Sec'y.

The index is most comprehensive and covers the contents of Volume I to XII inclusive, of the Proceedings completely, exclusive only of routine business. Volume I contains the twenty-eight bulletins issued at irregular intervals from 1898 to 1902. From 1902 to 1913 the Proceedings have been published in the form of annual volumes. The contents of the individual volumes appear in the table of contents of Proceedings which follows the index proper.



THE SILVER SOLUTION

To the Editor of The Metal Industry:

I have read with a great deal of interest that portion of the article on The Silver Solution appearing in the August issue of The Metal Industry, in which Messrs. S. Shoeld and G. B. Hogaboom very ably and with one exception, clearly state the case of the voltmeter as an instrument to be preferred to the ammeter for the plater. The one exception is their "endeavor to prove the argument by simple algebraic equations." They set out by making this statement: "If there was an error in the estimation of the cathode surface, say, for instance, that C was estimated to be half as large as it really was, then the current density would be 2 A/c, or twice as great as it should be."

Surely there must be a mistake here. If a plater, accustomed to use an ammeter and work to the current density stated, viz., 2 amperes to each square foot, were to miscalculate the total surface of his work as being, say, 10 square feet, he would presumably regulate his current so as to read 20 amperes. But assuming that the cathode surface was in reality 20 square feet, the cathodic current density would be only 1 ampere per square foot, or *half* what he supposed it to be.

Again, "If as before, the cathode surface was estimated to be half as large as it really was the resistance would then be directly proportional to $\frac{\frac{a+c}{2}}{2}$."

Under the circumstances this should be $\frac{a+2c}{2}$ if the fraction is to algebraically represent the true state of affairs, viz., a larger surface and therefore a decreased resistance. The authors suppose that a and c are equal and rightly state the equation as $\frac{A}{C} = \frac{V}{C2}$ but in the case above cited, the cathode surface is really 2 c so that we have

$$\frac{A}{C} = \frac{V}{\frac{3C2}{2}} = \frac{2}{3}\frac{V}{C2} \text{ not } 1\frac{1}{3}\frac{V}{C2}$$

i. e., the current density is really only ⅔ of the figure the plater erroneously put it at.

F. C. Robinson.

Sheffield, England, August 18, 1913.

NICKEL PLATING

To the Editor of the Metal Industry:

I feel sure that all electro-platers, nickel-platers especially, will wish to thank Oliver P. Watts for his instructive and practical article on the Electrodeposition of Nickel, which appears in the July Number of The Metal Industry. Also, I personally, was pleased to see that he had given us a goodly list of the different opinions from different scientists as to the cause of pin holes, porous spots, nickel spots, or whatever the platers like to call them. A plater cannot help but notice the contrary opinions expressed, and I think the plater will be as far from the cure of spotting as ever. Any plater with control over a number of nickel vats, will have noticed that it makes no difference whatever, if the solution be acid, neutral, or alkaline, they all turn out spots or pin holes with the work. Therefore, the question arises, is there a cure for pitting? I, myself, do not think so, but I know we can do a great deal towards doing away with the evil.

In the process of electro-deposition we must have the liberation of gas at the cathode, and we are told by one scientist that the cause of pinholing is due to the hydrogen *burning* the metal, thereby leaving a small pin hole. Say an article is sent to be nickeled, and let us suppose the article has a flat and a rounded side, it is prepared for plating and hung in vat, when it is well plated, take it out, and examine the article, it will be pitted on the flat side and not on the rounded side, and I find in the every-day workshop practice that it is the flat side in nearly all cases that is spotted and not the rounded side. I wish my fellow platers to take a generous view of my argument, re flat and round surfaces, as there is a great deal of difference between, say, a large tea and coffee urn and an artery forcep. An artery forcep is practically (for sake of discussion) similar to a pair of blunt scissors, and on the inside of the shank has a flat surface, on the outside of shank a rounded surface. Now, my result of observation of the nickeling of several thousand pairs of artery forceps, is that, if spotting has occurred, it is on the flat surface.

With a tea or coffee urn in the solution, the side nearest the bottom of the vat is the side which will be spotted. And so it is with other kinds of work, and I may say, I handle work of all descriptions, and run vats up to 50 amperes for work that is plating in one vat; so I have a good idea where pitting occurs. Why is this? My opinion (and it is, of course, quite possible for me to be wrong) is that, the gas which is liberated at the cathode, in some cases, is not strong enough to force its way to the top of the solution, and the surrounding solution holds the bubble of gas to the surface of work, therefore, the gas is practically, to all intents, a circular nonconducting medium, and, as the deposit on the article gets thicker, so in proportion does the pin hole get larger. Now, I notice, that when a nickel plater keeps lifting his cathode rod up, while the work is getting plated, thereby shaking or washing off the gas with the up and down motion, very little, if any, pitting occurs. Therefore, I think that if the work or cathode rods on a nickel vat were kept in constant motion, in the same way in which the tops of silver vats are worked, a great deal of spotting would be done away with. On looking through my English electro supply dealers catalogs, I find the same idea has been put on the market by Messrs. Cannings, of Birmingham, and as far as I know, they are the only firm in England to whom the idea has occurred. Whether any of the American platers are working on the mechanical motion principle or not, I do not know, but if there is, I am sure that his results would be of great interest and an educative lesson to all platers, if he would publish his opinion.

I therefore make an appeal to all interested in the trade, to discuss the evils of pitting, and see if a remedy cannot be found.

John W. Corteen,
Plater and Gilder,
The Plating Company, Ltd.,
Sheffield and Hatton Garden, London.

London, England, August 6, 1913.

VOLTMETER VS. AMMETER

To the Editor of the Metal Industry:

One cannot help but admire H. J. Ter Doest* for his stick-to-itive-ness, which must eventually solve the problem for him. Every once in a while some one apparently puts him down for the count, but always just before the stroke of ten is counted he comes up smiling, still seeking to land one in the neighborhood of his opponent's volt solar plexis. While these controversies sometimes assume awkward proportions principally on account of a too lavish use of sarcasm, yet I presume some good comes of them, especially so if the combatants never come face to face.

Personally, I am against Mr. Ter Doest in this Volt-Ammeter

*"Silver Solutions," The Metal Industry, August, 1913.

argument—but that "mox nix ous," or something like that. I shall not presume to criticize him for his belief, but I shall be exceedingly grateful if he will explain the exception to Ohm's law, which is clearly shown in his August article. By Ohm's law we learn that if any two of the three factors of an electric circuit are known, the third can be found.

$$\text{Thus } C = \frac{E}{R} \text{ or } R = \frac{E}{C} \text{ or yet } C \times R = E.$$

In Mr. Ter Doest's article he gives several sets of figures. When Ohm's law is applied, we find that by increasing the conducting surface of the anode he has increased the electric resistance 33⅓ per cent., apparently. He finds that for 50 square inches of surface to be silver-plated, 1 volt and 1.5 ampere is proper; then 1 volt divided by 1.5 ampere equals 0.666 Ohm's resistance, for the outfit with one anode.

By adding another anode he finds that he now has E. M. F. of 1.4 volts and only 1.4 amperes.

Treat these figures as above, and we find, 1.4 volt divided by 1.4 ampere equals 1 Ohm resistance for the circuit with two anodes, and without changing the rheostat during the test.

There is something wrong with the figures, and what I most desire is "more light." VOLTAMMETER.

SILVER AND ITS PROPERTIES

TO THE EDITOR OF THE METAL INDUSTRY:

After stating that my remarks in the "Silver" article* are misleading and erroneous, Mr. Herbert A. MeGraw proves that they are correct. This caustic comparison† between the Eastern and Western Hemispheres (*i. e.*, the whole world) and my own reference to North and South America and Australia is remarkable, in view of the fact that I omitted to name Africa, Asia, and Europe, in which *some other metals* are found in abundance.

But the most curious feature is that he states that "Mexico is the greatest silver producing country," and that "Mexico is followed by the United States, Canada and Australasia." Seeing that Mexico is *practically* in South America (it is truly South of North America, but is southern for practical purposes), and the United States and Canada are situated in North America, and that I named Australia, where am I *wrong* in stating that North and South America and Australia are the principal silver producing countries? How much silver is brought from actual South America into Mexico?

With regard to the processes of extraction it is unsafe to be cock-sure, because the methods of one month, in commercial and chemical matters, are largely superseded by new ones the next month. The new methods, however, do not destroy the existence of the old ones. We still have naked savages on the earth, although clothed civilization has been practiced for a very long time. New and old may be operated together, in different areas.

Mr. MeGraw's admission that "Smelting is undoubtedly responsible for the bulk of silver production" is charming.

I did not mention the cyanide process because I intended to deal with that phase of the subject in a separate article. If, however, as Mr. MeGraw says, smelting is responsible for the "bulk" of silver production—notice that "bulk"—the cyanide process used in connection with low-grade ores only cannot be so important or widespread as he suggests. I suspect that he has a personal interest in this cyanide process. I have yet to learn what misleading and erroneous statements I have made. It should be remembered that many primitive processes are still followed in various countries, notwithstanding modern improvements. I presume that nothing is the matter with the microscopical information, the dealing with which was my principal object in preparing the article.

JAMES SCOTT.

London, Edmonton, England, August 11, 1913.

*THE METAL INDUSTRY, June, 1913.
†THE METAL INDUSTRY, July, 1913.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

THE METAL INDUSTRY has had so many inquiries in reference to shop problems that have been previously published that it is deemed advisable in future to number each question. Since the inception of the department of Shop Problems 1,849 questions and answers have been published, without taking account of the many answered direct and by mail.—Ed.

ALLOYING

1850.

Q.—Will you kindly advise us what grade of ingot brass will be most suitable for making castings similar to a valve body? These castings must stand a pressure test of 180 pounds, the wall being a trifle over ⅛-inch thick.

A.—For valve body castings to stand 180 pounds you cannot use a much cheaper mixture than the following:

Copper	84 parts.
Lead	6¼ "
Tin	3½ "
Zinc	6¼ "

—J. L. J.

CLEANING

1851.

Q.—I have a quantity of tin novelties to be copper plated. They are not buffed. How can I clean them without scouring?

A.—To clean tin articles for copper plating when buffing is not require prepare a solution of two ounces of sodium carbonate to each gallon of water and use this in connection with a soft brass wire scratch brush. Brush the articles lightly and then wash in clean water, immerse in dilute cyanide, dip, rewash and plate.—C. H. P.

1852.

Q.—What is platers' compound?

A.—Platers' compound is used for cleansing articles in bulk form, adding from 4 to 8 ounces of the material to each gallon of water and heating to the boiling point by the aid of steam coils. The solution may be contained in an iron tank. Articles such as buckles and like nature that hold the buffing dirt very much are boiled out in iron wire buckets. Several thousand pieces may be cleansed at the same time.

The old name for platers' compound is whale oil soap. It is brownish black in color and has a considerable fishy odor. —C. H. P.

1853.

Q.—Can you tell me how to get soft solder out of the inside of german silver work?

A.—You will find it very difficult to obtain an acid that will remove the excess of soft solder from the inside of your work. If you cannot get at this with a regular inside scratch brush we suggest that you purchase No. 00 steel wire. If you bunch this up and fasten quite a little of it on the end of a piece of round hard wood, using cord to fasten it to the wood, you will be able to brighten up the surface of the solder that is impossible for you to brighten up under your present conditions. It is advisable to use a dilute sal soda solution when you cleanse the surface and when the wire is

not in use to prevent from rusting keep immersed in the soda solution. You may be able to arrange this wire in various ways so that you can use it mechanically to cleanse the soldered surface. Your own experience ought to give you the best information how to use this material. We know of no acids that will accomplish what you require.—C. H. P.

FINISHING

1854.

Q.—How can we obtain the old brass finish on iron chains which we are brass plating, without brushing on a wheel?

A.—In order to produce old brass finish on brass-plated iron chains without hand brushing, it will be necessary to tumble it in some manner after plating, using maple sawdust wet down with water and adding a small amount of pumice stone as the deadening agent. A simple method to follow if you have no tumbling barrel would be to procure a canvas bag or one such as used to hold oats or corn. Place in the bag the sawdust, pumice, a little water and the chain. Have two persons to handle the bag and shake the articles backwards and forwards by giving this motion to the bag. Many small articles may be given the old brass finish by this method. The articles should be washed, dried and lacquered in the regular way.—C. H. P.

1855.

Q.—What is the ivory finish?

A.—The ivory finish is produced by plating. First coating the articles after cleansing in the acid copper bath from 15 to 30 minutes or until an even dead finish is produced, the articles are then carefully washed and plated in the regular silver bath for 5 minutes or until the surface of the copper becomes pearly white. The articles should then be washed and dried carefully and then lacquered.

Sometimes the high lights are burnished or the depressions are shaded with a dilute mixture of yellow ochre and Umber mixed into a thin fluid paint and applied to the depressions with a soft brush and when nearly dry the excess wiped away with clean rag.

The dry colors should be mixed with turpentine, to which is added a few drops of gold size to remove the excess color from the articles. Rags moistened with a mixture of equal parts of turpentine and boiled linseed oil should be used.

The ivory finish is also produced by applying an ivory finish lacquer by spraying. The articles should be given a film in the silver bath before applying the ivory lacquers. This method gives a more even appearance.

Articles made from antimonial lead, spelter or iron should be lightly brass plated and then silvered before applying the ivory finish.—C. H. P.

GALVANIZING

1856.

Q.—Referring to your "Shop Problems" in your number for July, 1912, under the heading of "Galvanizing," we note that you say the questioner's bath lacks conductivity, and we shall be pleased to hear how we may ascertain what amount of conductivity exists in the tank or bath.

A.—The term conductivity is applied to any electro-plating solution. It depends upon its internal resistance. A solution that has a high internal resistance is frequently a poor conductor and with a low internal resistance a good conductor. Galvanizing and acid copper solutions are in this class.

The conductivity of the solution can only be determined by the appearance of the articles after being plated. If the deposit is uniform and recesses are well covered and show no dark spots or lines beneath the slinging wire or frame supporting the articles in the bath the term is then usually applied that the bath conducts well.

In nickel solutions unless the bath is properly prepared the deposit is frequently dark or recesses become dark or discolored and the metal does not cover freely, such a solution would lack conductivity. As a conducting agent common salt or sal ammoniac would be added to increase the conductivity and decrease the internal resistance. In electro-galvanizing baths aluminum sulphate, common salt and sal ammoniac are used for the purpose of thus increasing the conductivity of the bath. Similar agents are used in copper, brass and bronze baths, but these usually consist of sodium carbonate, sodium bisulphite and ammonium carbonate. In gold solutions phosphate or bisulphite of soda are used. In silver baths the variation is overcome by the additions of cyanide of potassium and small amounts of carbon bisulphite.—C. H. P.

HEAT MEASURING

1857.

Q.—Would you please inform me what quality in copper makes it employed in a number of largely used thermostats when other metals, such as brass and zinc, more sensitive and having a larger coefficient of expansion can be used? You will do me a great favor if you can explain this in some way.

A.—There must be an error in the idea that copper is employed largely in the manufacture of thermostats. I do not believe this can be true, for it is a well known fact that when copper has once expanded it will not return to its original size when the original temperature is reached. In other words, copper will set and become permanently greater in size after having been expanded. This tendency would prevent the rise of copper for thermostatic purposes. In one of the most widely known thermostats a brass alloy is used, composed of copper, zinc and tin in the proportions necessary to produce a high coefficient of expansion. With this composition the length of the strip is always the same at the same degree of temperature regardless of intervening changes. In another thermostat the expanding metal is a lamination of brass and nickel that is, it is made up of thin layers of these metals. This is also very sensitive to expansion and contraction and does not set.

I do not know of any thermostat in which pure copper is used as the expanding element, as it will not contract the same and you must have mistaken same for a bronze.—P. W. B.

LINING

1858.

Q.—I have a wooden tank lined with copper and seams soldered that is giving me considerable trouble at the seams leaking. In tearing out the old copper lining we noted that the copper (tinned on one side) was as good as new, but that in places on the seams the solder had turned black and became rotten. There were spots where the solder had almost disappeared. I replaced the lining, using the best solder I knew of and it is beginning to act the same way. It does not leak as yet, but the black spots are showing in the solder.

A.—If the solder acts as you say there must be some acid in the water which attacks the tin in the solder.

The water which attacks the tin in solder the most is rain water; it is a very pure water, whereas hard water, such as would generally come from a well, usually forms a protective coating over the lead. Lead is not attacked by many acids and it is for this reason that lead vessels are often used for strong acids.

Would advise lining the tank with sheet lead, buring the seams instead of soldering them and it will resist any acid that the water contains.—P. W. B.

MOLDING

1859.

Q.—We are experiencing trouble in running No. 12 aluminum into chills. Can you tell us of any ingredients that we could mix with the molten material to make it run more fluid? Also can you make any suggestions as to how we may successfully recast aluminum?

A.—No practical way of making recast aluminum more fluid is known and the only way to get fluidity is to use new No. 12 ingot. We would suggest that you pour it at high heat (1,500 to 1,600 degs. F.) when pouring into chills, although this gives a high melting loss and much dross.—J. L. J.

1860.

Q.—What is the most satisfactory molding and facing sand for the production of perfectly smooth yellow brass castings weighing from 4 pounds upwards in valve design?

A.—The ordinary brass molding sand is too fine for castings of this size and a rather coarse sand should be used—one that corresponds to the No. 2 Albany Sand.—J. L. J.

OXIDIZING

1861.

Q.—Can you give me a formula for a platinum oxidize suitable for sterling silver flatware and medals?

A.—Dissolve chloride of platinum in denatured alcohol and add a very small amount of sulphate of copper and sulphate of iron previously dissolved in a little boiling water. Apply the platinum oxidize with a very soft brush and heat the articles over a bunsen flame. The articles will immediately turn black. Care should be used not to add too much copper or the black may appear brownish in tone.—C. H. P.

PLATING

1862.

Q.—What are "Smuts" and how made?

A.—Smuts are developed in the plating solution and result from the use of high currents. For instance, an ordinary gilding bath at two to two and a half volts and the proper amperage will produce a good clear gold deposit, but increase the voltage from 6 to 10 volts and the gold color becomes a dead pinkish tone, giving the rose gold smut.

In the production of green golds the smuts are developed by higher voltage, and additions of arsenic or carbonate of lead to gilding baths produce the dark smuts which, when relieved with sodium bicarbonate show the gold through the smuts. Any dull deposit may be termed a smut or muddy color when applied to a metal surface by plating.—C. H. P.

1863.

Q.—Can you give me a remedy to prevent brass, bronze and copper solutions from plating on the tanks?

A.—Your question gives a very interesting problem for solution. So far we have come to the conclusion that it will be necessary to overcome your trouble, to line the tanks excepting the bottom. This can be accomplished by making a box-like lining of one-half inch pine or white wood, so that it fits snugly in the tanks. This lining will have to be fastened in position, and will probably overcome your difficulty. It appears to us that at the present time your solutions are acting as accumulators, owing to magnetic induction, which probably has a tendency to form an alternating current in your solution. This may have a tendency to change the polarity of your solution, which would cause the deposition on the inside of the tank because of the tank becoming negative. When working one tank your current strength overcomes the difficulty. Your problem will be given further consideration in an effort to locate this unusual difficulty.—C. H. P.

1864.

Q.—I am having trouble with my brass plating solution for plating on iron and steel. I get a heavy enough plate in one and one-quarter hours, but the lower ends of the work are red, while the upper parts are yellow. Can you tell me how to overcome the difficulty?

A.—Your solution contains too little metal. One and one-quarter hours' immersion should give you a substantial deposit. From the appearance of your work as noted by you, your solution needs a good substantial addition of copper. When a solution plates reddish it oftentimes denotes that the solution needs copper instead of zinc. The trouble experienced by many platers is due to the fact that too much zinc is added to a brass solution. If the solution is plentifully supplied with copper very little zinc is necessary to maintain a good yellow brass. Dissolve:

Carbonate of copper	2 ozs.
Cyanide of potassium	4 ozs.

for each gallon of solution in use, and add this at intervals to your solution. If the solution afterwards shows a reddish tone or muddy appearance, then dissolve carbonate of zinc in ammonia, preparing a concentrated solution and add a little at a time to bring up the right color. Follow these instructions and avoid potash, sodas and carbonate of ammonia, and you will have very little trouble.—C. H. P.

ROLLING

1865.

Q.—Please advise us if there is a good method that we could use for coating ¼-inch or 5/16-inch sheet steel with Babbitt metal on one side about 1/16-inch thick.

A.—To coat ¼-inch or 5/16-inch sheet steel with babbitt 1/16-inch thick use an A-1 babbitt like Britannia that can be rolled into sheet; tin the sheet steel, using 50-50 solder and a zinc chloride flux and while the casting is still liquid apply the sheet babbitt and pass through rolls or press together in hydraulic presses.—J. L. J.

STRIPPING

1866.

Q.—What is the best way to refinish nickel plated auto trimmings, such as large radiators and wind shields, that are worn through or have peeled and which cannot be dipped in a stripping solution?

A.—Your experience in refinishing automobile trimmings should be your best guide. It is difficult to make a satisfactory job of an article that is worn through or has peeled from defective plating. Of course, if the articles have only been lightly plated and show defective spots, by using a good soft wheel and white lime composition you can repolish the surfaces and then by what is termed the sponge method you can go over the defective places. While this is frequently done by many platers it is not good practice and does not give satisfactory results. The way to use this sponge method to get satisfactory results is to obtain a soft sponge, use a piece of nickel anode and wrap the sponge over carefully. Secure the sponge to the piece of nickel anode by using twine, so that it is bound firmly, and then secure to an insulated copper wire of sufficient size and connect to your positive pole. When you have repolished your trimmings that have defective spots cleanse the spots that require to be recoated in the usual manner and then support upon the negative pole or have a good stout copper connecting wire connected from the negative pole to the article. Immerse your sponge in the nickel solution, avoiding an excess, and then go over the defective parts to and fro until sufficiently coated with nickel. You will find that you will be able to buff this coating lightly and after the job is well done the defects will not be noticeable.

If you desire to refinish the parts in a satisfactory manner it is best to remove the old nickel by using a tampico wheel and emery composition instead of the usual buffs and tripoli. You will find this the most satisfactory method to remove nickel if the articles cannot be stripped. Of course, it is necessary, after the nickel is removed by this method, to recut and color in the usual manner before plating.—C. H. P.

TESTING

1867.

Q.—In a certain formula there is a certain reference to the silver nitrate method of testing silver solution in which you advise use of "a deci-normal nitrate of silver solution." What is meant by deci-normal?

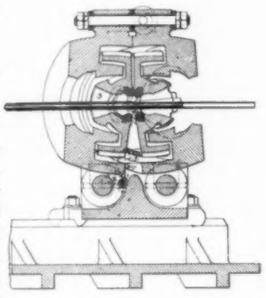
A.—A normal solution is one which contains the number of grams of a substance equivalent to its molecular weight dissolved in one liter of water. Thus the molecular weight of nitrate of silver being 170, a normal silver nitrate solution is one which contains 170 grams of silver nitrate in one liter of water. A deci-normal solution is one-tenth normal, or in this case would be a solution of 17 grams of silver nitrate dissolved in one liter of water.—K.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,067,806. July 22, 1913. **Manufacture of Seamless Tubes.** Samuel E. Diescher, of Pittsburgh, Pa., assignor to Metals Working Company, of Pittsburgh, Pa.

The invention relates to mechanism for reducing hollow billets to seamless tubes by subjecting the walls of the billet to compression between concave exterior surfaces and convex interior surfaces, such pressure being applied progressively along and around the billet.



The following claim describes the machine:

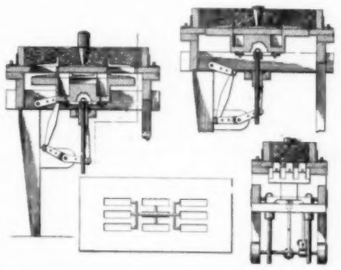
In a machine, as shown in the cut, for reducing hollow billets, the combination of a mandrel, two annuli having interior reducing surfaces movable around axes eccentric to each other, and to the axis of the mandrel and lying in planes at an angle to the axis of the mandrel, the eccentricity of the axes of the annuli relative to each other being such that the paths of movement of the reducing surfaces will overlap a distance proportional to the diameter of the billet to be reduced, said members being so arranged as to be simultaneously operative on diametrically opposite portions of the billet and having corresponding points within the working portions of said members on their respective axes lying in different planes perpendicular to the axis of the billet.

1,067,820. July 22, 1913. **Stripping Plate Molding Machine.** H. E. Kimball, Dallas, Tex.

This invention relates to an improvement in stripping plate molding machines.

The primary object of the present invention is to provide a simple and efficient apparatus for forming sand molds.

A further object of the invention is to provide means for effectually guiding the pattern in its vertical movement, the mechanism for raising and lowering said pattern being such that the upward stroke of the pattern may be accurately regulated, thus providing means for making deep or shallow indentations, in the sand.



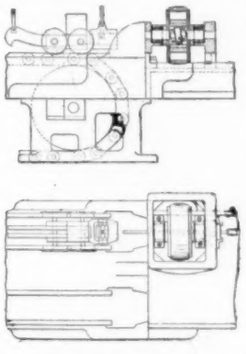
Claim 2 covers:

In a molding machine, as shown in cut, the combination of a frame, a stripping plate supported thereon, a pattern carrying block mounted for vertical movement, said block being formed with radially extending reduced portions upon which a pattern rests, a plate secured to the under face of said pattern carrying block, plungers arranged adjacent to the ends of said plate, bearings supported by said frame and slidably engaging said plungers, a shaft extending transversely of said frame and rotatably mounted thereon, a handle and arm rigidly secured thereto, said second mentioned shaft, and pivotally secured to said last mentioned link.

1,068,549. July 29, 1913. Means for loosening the tube from the mandrel in the manufacture of tubes. K. R. Westin, Sandoiken, Sweden.

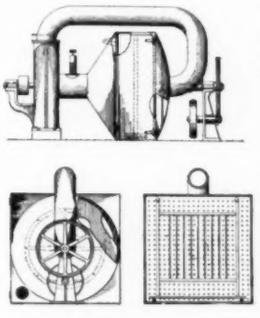
This invention relates to a device shown in cut for loosening the tube from the mandrel in the rolling or drawing of tubes, in which device are used rollers, in a rotating disk, casing or the like and journaled in an oblique direction relative to the longitudinal axis of the tube. This device, in combination with the mandrel, rolls the tube crosswise, thus enlarging the tube. The oblique position of the rollers relative to the tube causes the rollers to have a tendency to move along spiral lines around the tube, so that they do not counteract the motion of the tube, in its longitudinal direction, even though there is often a stress, in axial direction, between the rollers and the rotating casing.

The object of this invention is to so arrange the said parts that the effect of the said stress as an obstacle to the operation of the device, that is, to its rotation, is reduced to a minimum, the rollers at the same time being easily accessible for adjusting the pressure effected by the same. This object is gained by having the rollers journaled not directly in the rotary disk, or casing, but in special adjustable bearings provided in the same and by having the hollow trunnions of the disk or casing not wider than is necessary for the passage of the tube, and by having annular shoulders or bearing surfaces, on the said trunnions, which will sustain the axial pressure. Owing to this arrangement the device will run easily and the rollers can easily be tightened, when desired, the means provided for effecting the tightening being easily accessible.



1,068,736. July 29, 1913. Apparatus for Coating Objects with Subdivided Material. Franklin F. Bradley, of Chicago, Illinois, as assignor to Bradley and Vrooman Company, of Chicago, Illinois, a corporation of Illinois.

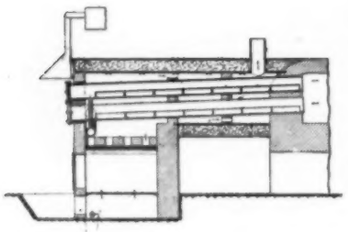
This invention relates to apparatus shown in cut for coating objects with comminuted, subdivided or powdered material and is of particular service in spreading bronze powder upon objects whose surfaces to be coated are covered or painted with suitable adhesive material or paint which in its fresh state holds the powder scattered thereupon and in its dry state firmly fixes the powder in place.



In practicing the invention, the inventor employs a receptacle for containing the object that is to be coated with the powdered material, a fan or blower for effecting forced circulation of air through the receptacle, and piping which desirably includes the blower and receptacle in serial relation to establish a closed local path or circuit, which is preferred, for the circulating air, though he does not wish to be limited to this way of practising his invention.

1,069,260.—August 5, 1913. Metallurgical Apparatus. Woolsey McA. Johnson, Hartford, Conn.

This invention relates to metallurgical apparatus such as that having the capacity of condensing metallic vapors at carefully controlled temperatures, but inasmuch as certain advantages characteristic of this invention prominently appear in its more intense



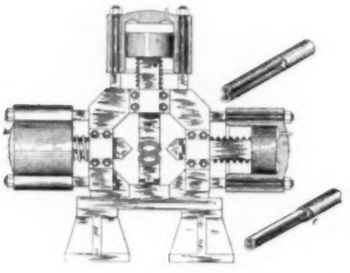
aspect as a means instrumental in continuously condensing vapors of zinc such as those obtained from a gas, electric, or other zinc furnace, it will be conducive to clearness to disclose this invention by way of such embodiment thereof.

This invention has in objective an apparatus shown in cut, capable of being built at low cost, from the standpoint of commercial efficiency, so constructed and designed as to enable a skilled workman to readily handle and operate the same, and of such nature as will not only very efficiently condense the zinc vapors, but also enable the temperatures to be controlled within commercially close limits. The patent covers:

An apparatus of the nature disclosed comprising, in combination, a zinc condenser having a jacket, a heat radiator, a pipe leading from said radiator to said jacket, means for causing gases to flow through said pipe into said radiator and return to said condenser, and means for varying the radiating surface of said radiator.

1,070,379. August 12, 1913. Tube-Pointing Machine. D. L. Summey, Waterbury, Conn., assignor to Chase Rolling Mill Company, of the same place.

Heretofore tubes have generally been pointed preparatory to being drawn, by subjecting them to the action of hammers in a machine furnished with a plurality of dies, the tubes being manually shifted from die to die and manually rotated during the pointing operation. This old hammer method of pointing tubes has been found to be objectionable, not only because each machine must have two or three attendants, but also because the hammering of the metal tends to crystallize it, and hence often results in time-consuming and dangerous breakages of the points during the drawing operation.

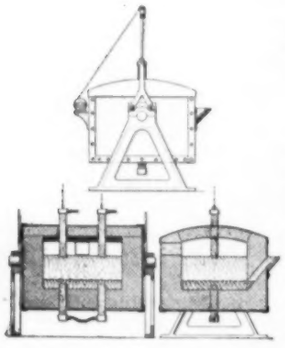


The object of the present invention is to produce a labor-saving, power, tube-pointing machine, as shown in cut, constructed with particular reference to quickly and symmetrically pointing the tubes by bending the metal rather than hammering it, whereby the crystallization of the metal in the points is wholly avoided.

1,070,568. August 19, 1913. Method of Melting Metals and Alloys. R. A. Wile, Pittsburgh, Pa.

This invention relates to melting of alloys which are liable to oxidation or vaporization when melted in the open air.

The object of the invention is to prevent or reduce the alloys due to such oxidation or volatilization during melting, and to that end it consists in forming under electrically developed heat a bath of high melting point, such as a glassy or slag-like bath, and feeding into such bath the metals and alloys to be melted and melting them by the heat of the bath while covered by the inert melted material.



The patent covers a method of melting metal and alloys, which consists in feeding the metal or alloy, as shown in cut, into and through an inert or molten bath of glassy or slag-like nature and of a higher melting point than that of the said metal or alloy, said bath being of substantially uniform depth within the furnace, utilizing said bath as a resistance element for the generation of heat to maintain its molten condition, and regulating the feeding of the metal or alloy and the tapping out of the molten metal or alloy to keep the layer of the latter substantially thinner than the overlying protecting layer of the inert bath.

1,069,113.—August 5, 1913. Non-Corrosive Metallic Alloy. John Coup, Marion, Ohio.

This invention relates to an improved metal alloy and has for its primary object to provide a composition consisting of a number of mineral constituents homogeneously commingled or mixed with a suitable deoxidizing agent whereby a metal alloy is produced which may be utilized as a substitute for nickel-plating and may be commercially used in the manufacture of various articles.

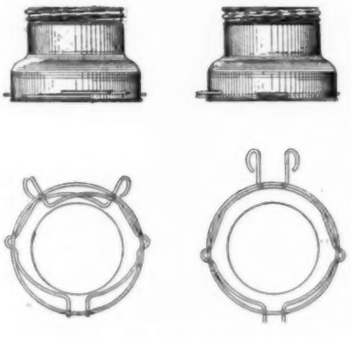
The constituents of the improved alloy are as follows:

Copper	69.13 parts.
Nickel	14.81 parts.
Zinc	8.64 parts.
Aluminum	3.70 parts.
Phosphor-tin	3.08 parts.
Lead	.58 parts.
Iron	.06 parts.

In the preparation of the alloy, the copper iron and nickel are first placed in a pot and inserted in a crucible. These two ingredients are heated to about 3,080 degs. Fahr., at which point they are liquified or melted. The heat is then reduced to about 700 degs. Fahr. and the zinc is now added in small quantities. After these ingredients have become thoroughly commingled, the lead is added. The heat is reduced to about 400 degs. Fahr. just prior to removing the pot, and the phosphor tin is then added to the mixture. The addition of this last ingredient destroys all the corrosive acids in the copper, zinc and nickel. During the preparation of the alloy, the compound is kept well covered with charcoal. After removing the pot from the crucible, the dross is skimmed from the surface of the mixture and the aluminum is added. The aluminum acts as a deoxidizing agent for the other ingredients.

1,070,644. August 19, 1913. Shade or Globe Holder. A. W. Wellington, Waterbury, Conn., assignor to Waterbury Manufacturing Company, of the same place.

This invention relates to an improvement in shade or globe holders, and particularly to that class which comprise a cup-shaped socket or holder with a wire shade or globe gripping device.



The object of this invention is to provide a wire gripping device, as shown in cut, which will firmly grip the globe or shade when inserted and which will provide a free opening for the insertion of a shade or globe.

The inventor claims: A shade or globe holder, comprising a shell formed on opposite sides with short slots with the perforations between said short slots, and with long slots opposite the perforations, combined with shade-gripping arms having ends extending through said perforations, bends extending through the short slots, finger pieces extending through the long slots, said arms formed with knees between the bends at the sides and the finger-pieces.

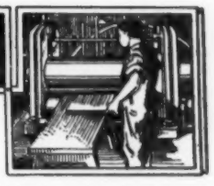
1,069,983. August 12, 1913. Furnace. Godfrey L. Schutz, Rochester, N. Y.

The object of this invention is to provide an improvement in furnaces, such furnaces as are used for case hardening the steel rings used for bearing surfaces in ball bearings, or for case hardening any other steel parts.

Another object of the invention is to provide a furnace, shown in cut, that will secure an even distribution of heat on the parts that are to be heated and hardened.

Another object of the invention is to provide special facilities in the furnace for exposing the parts to be case hardened uniformly to the heat from all directions.

EQUIPMENT

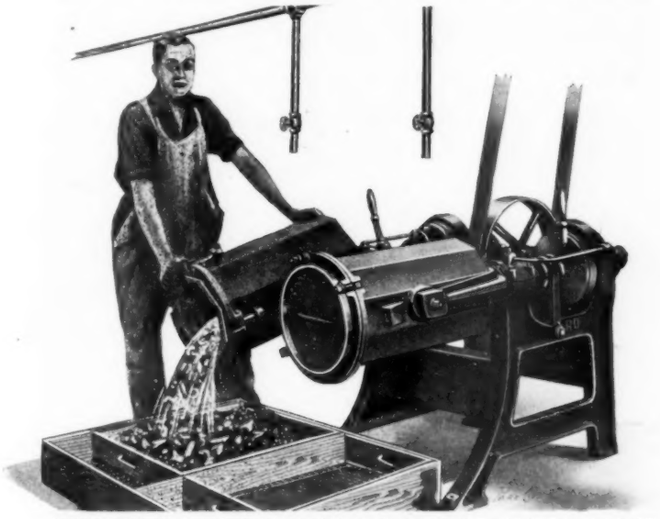


NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

BAIRD BURNISHING MACHINE

The machine shown in the cut is manufactured by the Baird Machine Company, of Bridgeport, Conn., and has been produced after a long series of experiments carried out under actual trade and shop conditions. In this barrel the troublesome element of gas formation with its attendant feature of gas vents has been eliminated. This has been accomplished by making the barrel in cylindrical form and filling it *full* of work and balls. The barrel can be tilted to an upright position, and when full to the top water is turned on to fill remaining voids. A small quantity of non-alkali soap is mixed in for a lubricator.

The cover is cast iron, a rubber gasket is attached to the machined face, four hinged bolts swing into slots on the rim of the cover and a couple of turns with a wrench is sufficient to make a water-tight joint. Being practically a straight cylinder the "Baird" takes long or short, light or heavy work with equal facility. The roll of the tank being in the direction of its shortest space, long articles do not become twisted and if the barrel is filled full it will handle anything up to its own length.



EMPTYING A "BAIRD" BARREL LIKE POURING WATER OUT OF A BUCKET.

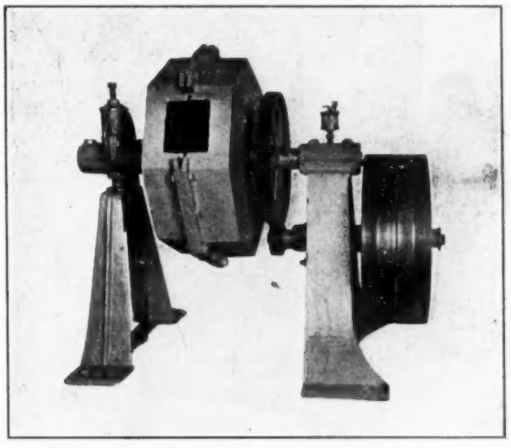
Each barrel of the "Baird" burnishing machine has its own friction clutch. One barrel may be stopped to fill or empty without interfering in any way with another barrel.

To empty, the barrel is first tilted to an upright position, the bolts loosened, and the cover removed. The cover opening is full size of barrel, there are no shelves or corners on which work can lodge, and no necessity of reaching in barrel and poking the products out. The full barrel is a balanced load, swinging on centrally located bearings. From the upright position, it is tilted over and emptied as simply, quickly, and easily as pouring water out of a bucket.

The "Baird" double burnishing machine carries two barrels on one frame. Both barrels are driven by one pulley, but are independent in action. A hand lever placed in convenient position on either side of the machine operates a friction clutch. One barrel can be stopped and emptied or filled without interfering with the continuous running of the other barrel. As can be seen by the illustration the machine is compact and occupies but a minimum amount of floor space. Further information regarding this and other ball burnishing machines may be had by writing for bulletin 303 M, Baird Machine Company, Bridgeport, Conn.

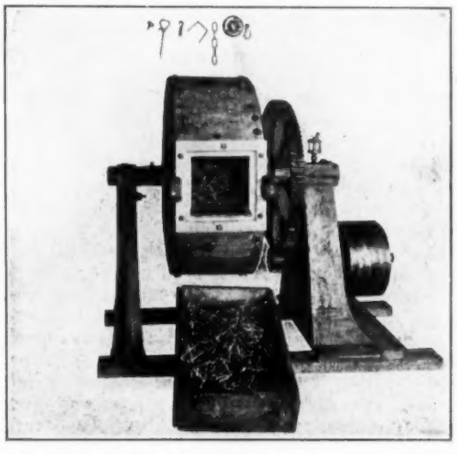
THE ALLEN WATER TUMBLER AND BURNISHING BARRELS

The E. J. Woodison Company, manufacturers of platers' and polishers' supplies, Detroit, Mich., are introducing the Allen water tumbler and burnishing barrels as shown in the cuts. These tumblers are made large in diameter and narrow for the reason that the weight of the work helps in the operation. A tumbler of this description, it is said, shortens time of operations 33⅓ to 50 per cent. The hand hole or entrance is large (8 x 8) and the machine can be run at almost any speed. Small gray iron



THE ALLEN BARREL READY FOR FILLING.

or malleable castings can be first tumbled in the water tumbler, the time required depending largely on hardness and roughness of same. Many kinds of small work such as hooks may be advantageously tumbled by putting in gravel with the sand and water. When so treated they can be taken from the barrel and



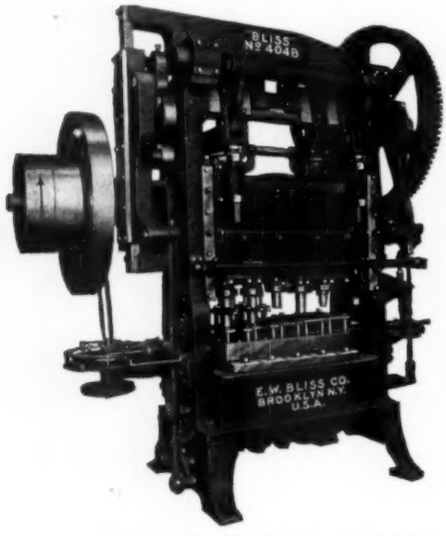
THE ALLEN BARREL OPEN, WORK FINISHED.

thoroughly washed and then be passed on to the burnishing barrel and left until sufficiently burnished, which usually takes from a half hour to three hours. After copper plating and nickeling operations about 15 minutes each time is required to get satisfactory results. Address the E. J. Woodison Company, Detroit, Mich., for further information.

NEW AUTOMATIC FEED PRESS

In keeping pace with the rapid advancement being made in the working of sheet metal and the demand for increased production, the E. W. Bliss Company, of Brooklyn, N. Y., have recently designed and placed on the market the Automatic Feed Press, shown in the accompanying illustration. It is adapted for the rapid production of deep-drawn seamless shells, such as lamp and lantern bodies and lamp fonts, oil can bodies, drinking cups and a similar class of articles which require a series of drawing operations.

The press is equipped with a friction dial feed and lateral feed, and has five slides each independently adjustable. Five operations are performed at each revolution of the crank shaft, from which it will at once be noted that production is increased and operation costs reduced materially over the old method of doing this work in single slide double action presses. In addition intermediate handling of shells between



THE BLISS AUTOMATIC FEED PRESS.

operations is eliminated. There is also a considerable saving in shop room, as this one press doing five operations replaces five single presses.

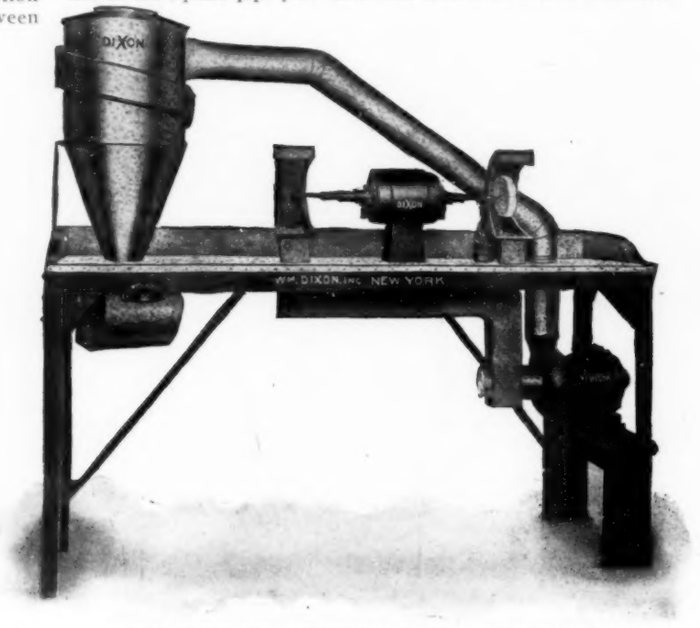
The operation of the press is as follows: Shells which have been cut and formed from the sheet are placed on the revolving disk of the friction dial feed, which carries them up and against an automatic stop gauge, which gauge allows one shell to pass out for each revolution of the crank shaft. On passing from the friction dial feed the shells are taken hold of by the lateral feed which automatically carries them from one to another of the successive dies, and finally discharges the finished article through a chute at the end of the press. The press shown operates at 35 strokes per minute, which means 100,000 operations in ten hours. From the description of the operations of the press, it will be seen that danger to the operator is removed, as all that is necessary is to place the shells on the revolving dial. The lateral feed which has two motions, an opening and closing and a backward and forward motion, is operated by cams and links from both ends of the machine; this construction gives a perfectly parallel feed motion. The bottom knockout is cam actuated and driven from the crank shaft through links and levers, and so made that its travel from each slide may be different according to the depth of draw. The press is provided with an automatic friction clutch, which places its movements practically under instant control of the operator. With this type of press the number of die operations which may be performed simultaneously is limited only to the number that may be done without annealing, as wider presses may be used and the number of slides increased.

Weight of machine shown in the illustration is 25,000 pounds.

DIXON DUSTLESS POLISHING BENCH

The polishing bench shown in cut accommodates two operators and it will be noted gives plenty of elbow room for each and no waste space. The bench is zinc lined from end to end and is fully equipped with all necessary cans and piping. It is mounted on iron legs and altogether the manufacturer, William Dixon, Inc., New York, claims it to be the most complete polishing and dry dust collecting outfit ever offered to the trade for the saving of ALL the value in gold, silver and platinum polishing dust.

The polisher will appreciate the ample space within the hoods for the work being polished. The air can be completely shut off from either hood at will by means of a cut-off slide at the back of the hood. When sending the contents of the receiving can to a refiner, the piping should be thoroughly brushed out. Notice how accessible the pipes are for cleaning—the slide at the left of the square pipe just under the table—the round clean-out



DIXON DUSTLESS POLISHING BENCH (FOR TWO MEN).

pocket below, opposite the exhaust motor. Should a heavy article fall into either hood when the screen was open, it would be caught and saved in this clean-out pocket. The picture shows a 3-inch brush wheel on the left and a 6-inch felt buff on the right spindle head; of course, any grinding or buffing wheels required for special work can be used.

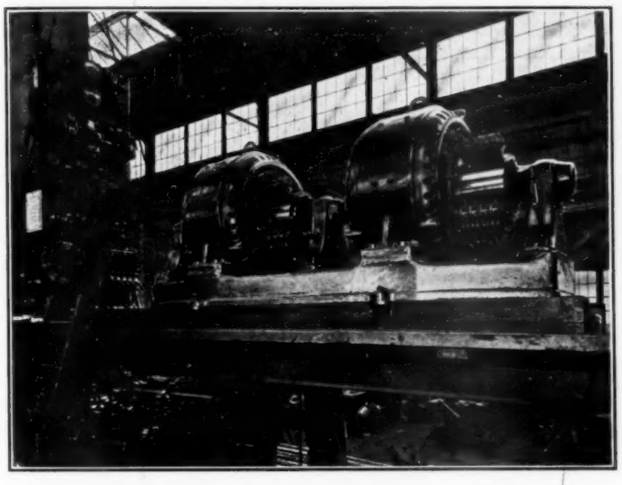
The price of this bench including blower and ⅓ h. p. motor attached ready for use varies from $100 to $108, according to the class of motor and the voltage. For further information address William Dixon, Inc., 39 John street, New York.

NEW ELECTRIC CLEANER

Chas. F. Luce, of Elmira, N. Y., reports that he has an electro chemical process for the removal of old nickel, copper, brass or any of the electro-plated metals. The process is said to leave the article in the same condition after the plate has been removed as it was before without the pitting of the base metal. Mr. Luce states motorcycle hubs which have been nickel-plated and which have been finished over 220 emery coloring wheel have the same finish after the old nickel has been removed as though they had been finished for the first time. This remover costs from twenty-five to twenty-seven cents per gallon and takes a current of 1½ volts to run. On two occasions Mr. Luce took the nickel off of 350 hubs and replated them without their being touched with the polishing wheel. This lot of hubs were an accumulation from a stock room and the finish had been chipped. He states that it takes from three to seven minutes to remove nickel and copper or brass can be removed in same solution. Demonstrations may be arranged for by corresponding with Chas. F. Luce, Elmira, N. Y.

ELECTRIC ARC WELDING APPARATUS

Electric arc welding differs from other forms of welding in that, by using an electric arc to produce a high temperature, the two pieces of metal to be joined are actually melted and flow together instead of being merely softened by heat and then caused to unite by applying pressure or by hammering. It is thus seen that the metal really becomes continuous and the joint is homogeneous. This accounts for the high efficiency of the joints secured by the arc method. Of course hammering is often resorted to after the weld has been made, but this is merely to improve the ductility of the metal and is not depended upon to unite the particles of metal. Furthermore the electric arc permits of welding such metals as copper, brass, etc. Welds in these metals are actual welds, that is, the metal flows together and becomes continuous and when proper materials are used the strength at the weld is equal to that of the original metal.



THE C. & C. ARC WELDING EQUIPMENT.

For making repairs, such as mentioned above, it is claimed there is no system that can compare with the electric arc. First, because the arc gives the most intense heat known (about 4,000 degs. C.), this high temperature is really not required to reduce the ordinary metals to a molten state but it has the advantage that heat is applied so quickly that the conductivity of the metal cannot carry the heat away fast enough to lower the temperature at the weld. This accounts for the rapidity and efficiency of electric arc welding and explains how the welding heat can be applied to as small an area as desired and not dissipated over the whole work, which in the case of a large casting would waste an enormous amount of heat. Second, it is easy to manipulate, requires no complicated apparatus or previous preparation for the work in hand, such as, the generation and storage of oxygen or other gases. Third, it is the cheapest method so far devised for obtaining these high temperatures on a commercial scale. Fourth, it is safe. There is no danger from explosions and the low voltage current can be handled with impunity. The operators are subjected to practically no heat and no noxious gases which might overcome the men are given off.

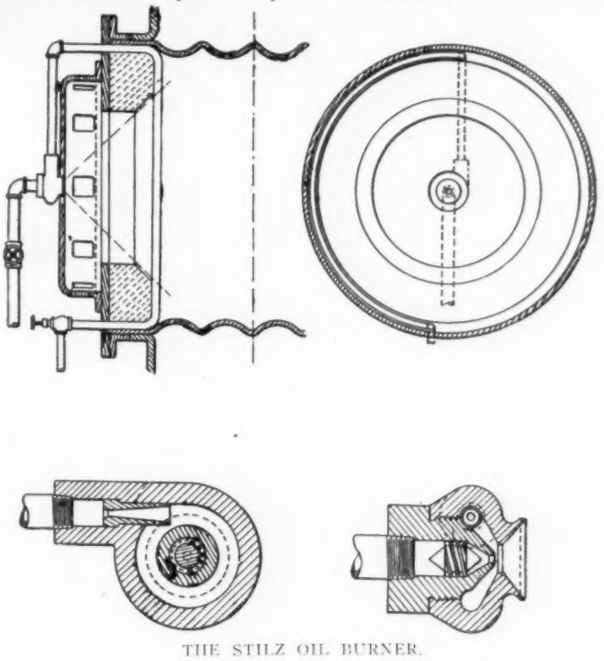
Electric arc welding may be divided into two classes, namely, that requiring the graphite electrode and, secondly, the metallic electrode. The graphite electrode method requires a potential of 50 to 60 volts at the arc, and a current of 300 amperes or more. When the metallic electrode is used, the potential at the arc is usually lower according to the nature of the work. In this process the metallic electrode is consumed, particles of molten metal from the electrode being deposited on the work being repaired. Thus the process has to be interrupted from time to time so that the operator can insert a new electrode. An important use of the metallic electrode is in repairing cracks in large work, for the operator can work on vertical or overhead surfaces.

The apparatus shown in the cuts is being manufactured for electric arc welding by the C. & C. Electric and Manufacturing Company, of Garwood, N. J., who will be pleased to send descriptive catalogue M upon application.

OPERATOR USING FACE SHIELD AND METALLIC ELECTRODE HOLDER IN C. & C. WELDING.

THE STILZ OIL BURNER

The oil burner shown in the cut has just been patented by H. B. Stilz, of Vallejo, California. (United States patent 1,066,-161, July 1, 1913.) In this burner steam is brought into action upon the oil in such a manner that the mechanical action of the jet is not interfered with. This is accomplished by the simple expedient of a readily accessible steam superheating coil which prevents all possibility of destruction of atomization by reason of the oil becoming too hot. Mr. Stilz has produced a burner which will efficiently burn any of the different kinds of fuel oil



THE STILZ OIL BURNER.

in commercial use and reduced to a minimum the quantity of steam needed to assist in the atomization of the oil. The patent claim covers in combination, a furnace having an admission hole through its casing, a lining of refractory material for said hole, a nozzle having means for projecting a hollow cone shaped film of oil into said furnace through said hole, means surrounding said nozzle for producing a whirling stream of gaseous fluid directed so as to penetrate said film of oil, and means for supplying air into the furnace through said hole.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

AMERICAN INSTITUTE OF METALS

President, L. W. Olson, Mansfield, Ohio; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 106 Morris avenue, Buffalo, N. Y. The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The next convention will be held at Chicago, Ill., October 13-17, 1913.

Dr. H. W. Gillett, chairman of the Papers Committee states that the following papers have been promised for the convention to be held in Chicago, October 13-17, 1913.

W. Arthur, "Fluxes for Soft Solders."
W. Arthur, "Aluminum Solders."
E. A. Barnes, "The Efficiency Engineer in the Foundry."
C. B. Bohn, "How Scientific Management Works in Our Plant."
G. K. Burgess, "Work in Metals at the Bureau of Standards."
G. K. Burgess (will open an informal discussion on) "Nomenclature of Non-Ferrous Alloys."
E. F. Bulmahn, "Producer-Gas for Brass Melting."
G. H. Clamer, "Report on Committee on Co-operation With the Bureau of Standards."
G. H. Clarmer and C. Hering, "The Hering Furnace for Commercial Brass Melting."
W. M. Corse, "Scientific Management."
O. F. Flumerfelt, "Core Room Economics."
H. W. Gillett and A. B. Norton, "Approximate Melting Points of Some Commercial Copper Alloys."
J. E. Howard, "Internal Strains in Bronze Castings."
C. P. Karr, "The Brass Foundry of the Future."
C. E. Knoeppel, "How to Make a Time Study."
A. D. Little, "Report of Official Chemist."
F. A. Parkhurst, "Scientific Management in the Brass Foundry."
C. L. Parsons, "Account of Co-operative Work of the Bureau of Mines With the American Institute of Metals."
G. Petinot, "The Stassano Furnace for Brass Melting."
J. W. Richards, "Vaporization of Metals."

INSTITUTE OF METALS

President, Professor W. Gowland, F. R. S.; Treasurer, Professor Turner, M. Sc.; Secretary, G. Shaw Scott. All correspondence should be addressed to the Secretary, G. Shaw Scott, M. Sc., Institute of Metals, Caxton House, Westminster, S. W., London, England. The objects of the Institute are for the educational welfare of the metal industry.

The Institute of Metals held a very important autumn meeting at Ghent, Belgium, August 28 and 29. The meeting was attended by metallurgists from all over the world who assembled in the Palais des Fetes of the exhibition, which had been placed at the disposal of the institute by the Belgian government. Professor A. K. Huntington, president of the institute, presided.

A number of very important papers were read and discussed at this meeting. The chief one arousing the most interest is the Second Report to the Corrosion Committee (an abstract of which is published in this issue of THE METAL INDUSTRY) by Dr. G. D. Bengough, M. A., and Mr. R. Jones, B. Sc. The document had been eagerly awaited by engineers and metallurgists for upwards of two years and the report, as expected, showed that the experimental work that the institute has been conducting at Liverpool for the past two years has yielded very practical results, indicating clearly not only the causes of the corrosion of condenser tubes, but giving suggestions as to how such corrosion may be eliminated and opening the way for a saving to shipowners, engineers, etc., of tens of thousands of pounds per annum.

Other papers presented at the meeting were as follows: "Metallographical Researches on Egyptian Metal Antiquities," by H. Garland; "The Specific Volume and Constitution of Alloys," by W. M. Guertler; "Copper Rich Alloys," by S. L. Hoyt; "The Annealing of Gold," by T. K. Rose; "The Intercrystalline Cohesion of Metals," by W. Rosenheim and D. Ewen; "A Further Study of Volume Changes in Alloys," by J. H. Chamberlain; "The Micro-Chemistry of Corrosion," by C. H. Desch and S. Whyte; "Some Copper Zinc Alloys," "A Method of Improving the Quality of Arsenical Copper," by F. Johnson; "The Influence of Phosphorous on Some Copper-Aluminum Alloys," by A. A. Read, and "The Determination of Oxygen in Copper and Brass," by T. West.

AMERICAN ELECTRO-PLATERS' SOCIETY

(AN EDUCATIONAL SOCIETY.)

President, Geo. B. Hogaboom, New York; Secretary, F. C. Clement, 462 North 50th St., Philadelphia. Pa. All correspondence should be addressed to the Secretary. The objects of this society are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. The society meets in convention in the spring of each year, subject to the decision of the executive committee. The next convention will be held the first week in June, 1914, at Chicago, Ill. The branch associations hold monthly and semi-monthly meetings in their various cities.

The regular monthly meeting of the New York branch was held at their rooms, 309 West Twenty-third street, August 22. There were thirty-five members present. An interesting discussion was had on the reduction of silver and copper in their cyanide solutions and the cause of green and brown slime forming on copper anodes. The plans for the annual outing and shore dinner which was to have been held on August 23 were abandoned for this year.

TRADE PRESS CONVENTION

The eighth Annual Convention of the Federation of Trade Press Associations will be held at the Hotel Astor, New York, September 18-19, 1913. Two sessions will be held daily. There will be editorial, circulation, advertising and publishing symposiums, under competent leaders. Many of the leading editors, business managers, buyers and sellers of advertising and authorities on modern merchandising methods will take part.

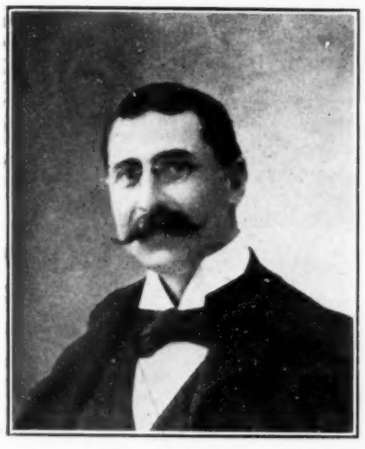
On Friday afternoon, September 19, there will be a mass meeting with addresses by representative business and professional men, on subjects of timely interest to editors, publishers and advertisers. Distinguished guests and worth while speakers will be at the annual banquet, which will be made a memorable

social occasion. Invitations are being extended to manufacturers, sales managers, advertising men, trade paper publishers and all others interested in the idea of business promotion through trade press efficiency, which is to be featured at the convention.

All the regular sessions of the convention are open. Whosoever will, may come, but tickets must be secured for the Inspirational Mass Meeting, held on Friday afternoon, September 19. These may be obtained on application to any member of the Federation or to the Committee on Arrangements. Seats at the Annual Banquet are $5.00 each. Application should be made to M. C. Robbins, Chairman of the Banquet Committee, 239 West Thirty-ninth street, New York. For further information address William H. Ukers, Chairman of the Committee on Arrangements, 79 Wall street, New York, who will gladly answer all questions.

ITEMS OF INTEREST TO THE INDIVIDUAL.

F. H. SEYMOUR



F. H. SEYMOUR.

Frederick H. Seymour, age 63, and well known in Detroit, Mich., as an author, inventor and business man, died at his home in that city July 28, 1913.

Mr. Seymour was born in Waterbury, Conn., and was educated there. He went to France and completed a course in medicine and art. Mr. Seymour was quite a noted inventor and devised many ingenious tools and machines, among which was the well known Acme wrench, for which the French academy awarded him a medal. He also gained considerable distinction as inventor of the Seymour cash register. Mr. Seymour was for ten years secretary of the Detroit fire commission and left it to organize the Detroit Copper and Brass Rolling Mills, but his interest in newspaper work and art caused him to withdraw from industrial life and he became editor of various trade organs. He wrote many books, among which are "Yutzo," "Confucius" and "Dennis Fogarty." He was a member of the Numismatic Club and Antiquarian Society of Philadelphia, Pa., and many scientific bodies in Detroit and other cities. Mr. Seymour leaves a widow and a son, Frederick M., eight years old.

Nelson J. Clayton, president of the Clayton-Lambert Manufacturing Company, a well-known resident of Detroit, Mich., and a long-time brass manufacturer, died at his residence the first of the month. He was 72 years of age and came to Detroit originally from Rockport, N. Y., about ten years ago, and soon after began the manufacture of plumbers' supplies, which included a well-known style of blow pipe. He is survived by his wife and one daughter, Frances Grace Clayton. The factory he aided so materially in building up was closed on the afternoon of the funeral.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

HARTFORD, CONN.

SEPTEMBER 2, 1913.

Important changes in the industrial plants of Hartford, including the abandonment of the Columbia Motor Car Company's factory by the Maxwell Motor Company, which controls the stock of the concern; and the removal of some lines of products to Westfield, Mass., the decision to quit the field of makers of four cylinder automobiles and an important new financial plan by the Pope Manufacturing Company, have marked the past month in the metal manufacturing business here.

Probably the most important move of the month was the abandonment of the Columbia factory. Following its policy of concentration, the Maxwell Motor Company, which has controlled the stock since early in the year, decided to close the Hartford factory, along with factories in Tarrytown, N. Y., and Providence, R. I. Several factories in the Middle West will continue to operate, it is said, but will make only small, cheap cars. At one time 1,200 men were employed in the Columbia factory. Within a year, the number has been 500. About 150 remained when the final decision to abandon the factory came. The last of the machinery and motor car parts were shipped to other factories of the company September 1. The factory was originally built in 1895 by the late Col. Albert A. Pope as a motor department of the Pope Manufacturing Company. Then it became the Columbia & Electric Vehicle Company, and in 1897, the Electric Vehicle Company was incorporated in New Jersey at $10,000,000, occupying the factory. In 1907 receivers were appointed for that concern, which would have gone under years before excepting for the immense revenue it received by its control of the Selden patents. The Columbia Motor Car Company was organized, and continued until two years ago, when the United States Motor Company secured control of the stock. When this concern became insolvent, the reorganization committee gained control, took the name, the Maxwell Motor Company, and under this management the 1913 Columbias—the last by that name that will ever be sold—were made. Henry W. Nuckols, president of the company, has announced no plans for the future. The factory, one of the largest in the city, will be sold if a purchaser can be found.

The so-called West Works of the Pope Manufacturing Company have been closed, and the concern has taken a part of its business to the bicycle factory at Westfield, Mass., which it

owns. During the month the company announced its intention to discontinue the manufacture of four cylinder automobiles, and concentrate upon "sixes." All "fours" remaining in the factory or in the hands of dealers were put on the market at a reduced price. This company is negotiating a $2,000,000 mortgage loan upon its valuable properties here, that it may have more ready capital. The negotiations are being conducted by Hallgarten & Company, bankers, of New York. Harry M. Bronner is scheduled for a place on the board of directors to represent the financial interests. It is stated by President Albert L. Pope that the expenses of building up the gigantic business have made profits smaller than they should have been.

Hiram Percy Maxim, inventor of the Maxim Silencer, has been protected against loss of the exclusive use of his name by the United States patent office, which refused to allow the Utah Oil Refining Company to market a lubricating oil under the name "Maxim." Commissioner Moore, in refusing an appeal, gave the opinion that the word suggested an individual because of his inventions.

The July report of the Pratt & Cady Company, makers of valves, now in the hands of a receiver, has been filed with the superior court. When the report was presented, counsel for the receiver asked for an order to sell the plant to Bishop White, of West Hartford. An order was granted to give Mr. White a six month's option for $25,000.—A. L. M.

PROVIDENCE, R. I.

SEPTEMBER 2, 1913.

All lines of the metal industries in this vicinity are showing decided indications of renewed activity and the increasing number of advertisements for help in the various branches appearing daily in the local newspapers, is substantiation of a practical and material character. With the annual vacations, shut-downs and clean-ups in the past the factories are starting up with satisfactory outlook, and everywhere reports are very optimistic, the manufacturers all looking for a good fall and winter business.

In the manufacturing jewelry lines this is especially true. Anxiety concerning the effect of proposed tariff changes have had a somewhat deterrent influence for several months, but as the time for the placing of fall and holiday orders is at hand and the tariff legislation is yet in abeyance, the jewelers all along the line are taking courage and are commencing to brush up on their business activities with the result that everyone is beginning to rush.

The E. C. Bliss Manufacturing Company, of Providence, manufacturers of chain and brass and metal letters, has been reorganized and will be merged with A. H. Bliss and Company, of North Attleboro. Edwin C. Bliss has sold his interest in the Providence concern to Frank H. Bliss, and the business of both concerns will be continued at North Attleboro to which the Providence plant is to be removed.

George W. B. Clarke, for several years employed in the graduate department of the Brown & Manufacturing Company in this city, but for the past year with Frary, Landers & Clarke Company, of New Britain, Conn., has perfected an aluminum water bottle which is to be placed on the market in a short time.

There are material evidences of prosperity at the works of the United Wire and Supply Company, on Mill street, Central Falls, where, in order to keep up with the business, it is found necessary to run the works until 10 o'clock three nights a week. Even with working overtime, the orders cannot be filled as fast as they are coming, so that the future prospects are unusually bright. There are from 180 to 200 hands employed at the plant.

The ruins of the old plant of the American Enamel Company which remained after the disastrous fire in the early part of June, have been entirely cleared away and work is about to begin on the erection of new buildings, larger and better equipped than those destroyed.

Following out his custom of several years standing Fred E. Newell, of the Newell Brass Foundry, Central Falls, entertained his employees at his summer home at Oak Bluffs, Mass., the last week in this month. Every year the men are invited to spend the week-end with their employer, leaving their work on Friday and remaining at the Bluffs until Sunday evening. Arriving at the island the men were taken in automobiles and quickly driven to Mr. Newell's cottage where supper was in waiting. Boating, fishing, automobiling and other diversions passed the time all too quickly for the members of the party.

The Brown & Sharpe Manufacturing Company's plant reopened on Monday, August 18, following the annual two weeks' vacation period. During the time that the plant was closed the interior was renovated and repainted wherever it was needed, about 300 men being engaged in this work.—W. H. M.

BOSTON, MASS.

SEPTEMBER 2, 1913.

There is a lingering sort of vacation spirit in the Boston metal industries, and trade is described as quieter than it is ordinarily at the beginning of fall in nearly all lines. Yet certain manufacturers—more particularly the specialists, it must be admitted—state that they are fairly busy at present and cannot complain of what the year as a whole is likely to yield them. E. B. Badger & Sons Company probably size up the general situation as closely as it is possible to describe it, in saying that "new orders, while not of great volume, supplement the business previously in hand sufficiently to keep the workers fairly busy." There is keen competition, however, for new orders, and some contracts recently placed have been taken at a very low figure. The outlook cannot be said to be extra good, therefore, for fall trade. Yet everybody is optimistic because of the assurance that the year in its entirety will show a good total, even if the remaining months are not as active as the first half of the year has been.

The Boston Nickel Plating Company, whose plant was crippled by fire several weeks ago, is in complete running order again and has a fair amount of work in hand, although reporting the general tone quieter than it is usually in September.

Herman Strater & Sons have found the year thus far very good in their lines of production, and are now awaiting reports from salesmen who start out this month, with the expectation that good business will be booked.

McKenney & Waterbury Company celebrated its 25th anniversary August 28 by giving a dinner to its clerks, salesmen and department chiefs at the Atlantic House, Nantasket Beach. William McKenney, in an after-dinner speech that was greeted with cheers, recited the history of the growth of the concern, which started with eight employees and was located in one floor and basement, but has now two large buildings and upward of 100 persons on the payroll. Souvenirs were distributed, and altogether it was a red-letter occasion.

Henry G. Morris has become a partner in the Boston Jewelry Manufacturing Company, on the top floor of the Jewelers' Building.

A new corporation of the past month is the Koonz Manufacturing Co., of Greenfield, Mass., organized with $5,000 capital by Frederick W. Koonz, Wm. C. Bowen and George C. Lunt.

Norling and Bloom, manufacturing jewelers, Washington Building, this city, have incorporated as Norling & Bloom Company, with $36,000 capital. John R. Smith is president and Arthur S. Kelley is treasurer.

Kagan Brothers Company, Inc., Lawrence, Mass., have been granted a charter to manufacture all kinds of jewelry. The capital is $5,000. S. N. Kagan is president, Benjamin W. Cohen treasurer and J. Kagan is the third director.—J. S. P.

NEW BRITAIN, CONN.

SEPTEMBER 2, 1913.

The outlook for a busy fall season appears good in New Britain as most of the large manufacturing concerns have many orders on hand and a few have been running full time on Saturdays, owing to the rush of orders. Several local concerns are adding to their plants, which may be taken as a sign that they have no faith in the reports that this is to be a year of extreme industrial depression.

At the P. & F. Corbin division of the American Hardware Corporation general business remains about on a par with the past few months, although a few departments are picking up. After running but fifty hours per week for some time the door check department is again working on the regular fifty-five hour schedule and the unit lock department is working nights for a total of seventy hours per week, in order to keep abreast of

their contracts. An important addition to the P. & F. Corbin division is the raising of the factory building, containing at present the shipping, packing and stock departments, from three to six stories. The contractors have been at work on the structure all summer, and the masonry and carpentry work should be completed inside of another month. When this is done it is understood that a number of the departments will be shifted about.

That the New Britain Machine Company is looking forward to a successful near future is evidenced by their recent purchase of valuable land. They have bought a tract with a street frontage of about 84 feet and also a valuable railroad frontage. This is an ideal site for the erection of other structures as they are needed and from the present phenomenal growth of this concern it will be needed before long.

The Stanley Works, makers of wrought brass butts; the Stanley Rule and Level Company, manufacturers of carpenters' tools; Landers, Frary & Clark, cutlery makers; Traut & Hine, light metal novelty makers; North & Judd, manufacturers of harness buckles and other small metal articles and practically all of the other concerns in New Britain are running close to their schedule for past summers. This past month has been one of general house-cleaning and the several concerns are getting ready for the winter. The Skinner Chuck Company is strengthening the foundations of its latest factory building by putting in new concrete piers in place of wooden ones and is also connecting a new six inch water main with the shop. This will give them a supply from two six inch mains.—H. R. J.

WASHINGTON, D. C.

SEPTEMBER 2, 1913.

In the tariff bill now in the Senate the rate of duty on aluminum is 2 cents per pound, and bauxite is placed on the free list. It has been charged that this is a favor to the trust, and under ordinary conditions it would be. It will, however, produce more effective competition than to place aluminum on the free list. The patent on making aluminum has expired, and the monopolistic control of the Aluminum Company rests on its ownership or control of the bauxite supply. Independent companies are at its mercy. It is therefore proposed to give these independents access to the unlimited supply of foreign bauxite and to protect their product with a duty. Free trade in aluminum and its products would not injure the Aluminum Company on account of the international agreement. It would kill the independents, however, and leave the American market to the "trust." Apparently the Democrats have adopted the only way of encouraging competition in aluminum production.

The aluminum industry in the United States is practically controlled by one concern, the Aluminum Company of America. A few years ago a suit was brought by the federal government against this company charging it with being a corporation in restraint of interstate trade under the Sherman anti-trust act. In the petition in this equity suit we read the following:

"The use of aluminum in commerce and the industries is a matter of comparatively recent development. Though the metal has been known since about 1722, yet prior to 1889 it was regarded as a precious metal extracted only in small quantities, at great expense, and sold by the ounce. In 1886, Charles M. Hall applied for a patent on a process, by which he was able, with the aid of the electric current, to produce aluminum cheaply in large and commercial quantities."

The Aluminum Company has built up its monopolistic control on the Hall patent. Aluminum is now sold for 20 to 30 cents per pound and produced in quantities totaling millions of pounds each year. It is best known as a material for making cooking utensils, but it has many uses; especially in the automobile industry, and its use in the latter line is growing rapidly.

Bauxite is the raw material from which aluminum is made. It is an ore or clay, and is found in extensive deposits in the southern states. The government alleged in its petition that the Aluminum Company of America owns and controls 90 per cent. of the known supply of bauxite in the United States. This is an important fact to be considered in determining the tariff on aluminum.

The Aluminum Company of America owns the Northern Aluminum Company of Canada. Through the Canadian Company it entered into an agreement in 1898 with all foreign manufacturers of aluminum. On this point it is of interest to recall the testimony of Mr. Davis, head of the Aluminum Company, or, more properly, its representative. When he was before the committee conducting the tariff hearings, he testified that their only contract was between their Canadian Company and the European companies. He replied, however, in answer to the question if this prevented the European companies from importing into Canada that such was not the nature of the contract. Continuing, he said that the companies agreed to subject themselves to certain rules of a committee, both with respect to price and quantity of output and so forth, such agreement preventing competition between his company in Canada and the foreign manufacturers. Mr. Davis admitted that this agreement was successful in preventing that competition.—J. J. M.

READING, PA.

SEPTEMBER 2, 1913.

G. A. Schlechter, manufacturing jeweler, has moved in a new factory, having much larger space and more machinery. He is also assembling 250,000 dollar watches this year. Harry E. Williams, late of Williams & Anderson, of Providence, R. I., who is an expert plater, has been engaged as foreman to succeed Hugo Aderer.

The L. D. Anderson Jewelry Company, making wire and abalone shell jewelry, say there is a great scarcity of abalone shell. The abalone blister has doubled in value and is becoming extinct.

Cohen Bros., 528 Penn street, have engaged Dan Brenniser, of Newark, N. J., to take charge of their manufacturing and repair department.

The Reading Optical Company (manufacturers) expect to move to a larger building, where the facilities will be improved and enlarged. J. M. Webster is the general manager.

T. A. Willson & Company, manufacture 14,000 pairs a day of cheap eyeglasses and spectacles, the frames made of steel, German silver and bronze. The machinery is automatic. They have bought property nearby the present plant to build an addition. The present plant was enlarged three years ago and the output was tripled.

The Pennsylvania Optical Company make 18,000 pairs a day of steel, German silver and alloy eyeglasses and spectacles. Have 150 hands and automatic machinery throughout. The building was erected for their own use. M. L. Miller, the manager, makes a trip to Europe this year. This firm has also bought the William Wilson lens grinding plant at Stroudsburg, Pa.—H. S.

LANCASTER, PA.

SEPTEMBER 2, 1913.

Lancaster is a good manufacturing place, having 60,000 inhabitants, and is in the center of the large tobacco raising country, in Lancaster county.

Schwartz and Gerz, of 235 West Grant street, make umbrella handles of Brittania and white metal, plated, advertising novelties, manicure sets, etc. They expect to enlarge on the manicure line and also will make cutlery. They do designing for large silverware manufacturers.

There is a very large business here in making umbrellas. Rose Bros., and Follmer, Clogg and Company, each make about 10,000 a day. The handle tips make quite an industry, being made of brass, gold, bronze, silver, pearl and wood. The Rose Bros. Company, who manufacture umbrellas, will also branch out in the line of making metal lamp shades.

C. Haller, Jr., of North Andrew street, who was with Harry Orr, has started a brass, bronze and aluminum foundry, on North Andrew street. Mr. Orr is now foreman at the foundry of J. Walter Miller. The Carbon Steel & Brass Company, have gone into the brass casting line. E. B. Andes & Company, of 630 East Main street, are busy on flasks for brass foundries, punch and die work, pattern work and special machinery.

The Conestoga Job & Brass Foundry are continuing business at the Model Brass Foundry. The Safe, Padlock & Hardware Co. are conducting their brass shop as the Fulton Brass Foundry. They are very busy, have lots of orders, and the outlook is good. The Safety Manufacturing Company have bought the plant of the Independent Foundry Company in Harrisburg avenue and

will make crucible steel, as well as work in brass. They make an emergency door for theaters, schools, churches, etc.

J. Walter Miller, of 411 East Chestnut street, has a large factory making locks, padlocks and hardware specialties. Some of the lines they put on the market themselves, others they make for different manufacturers; also make a lot of piano hardware, are very busy in the plating plant and have a complete brass, bronze and aluminum foundry. The Conestoga Brass Foundry is now called the Ideal Brass Foundry and have moved from 246 North Christian street to South Queen street. C. L. Smith, who was with Futer, has bought the A. L. Futer Company, 143 North Christian street. He does plating and expects also to manufacture some metal lines.

The Novelty Manufacturing Company, of 425 Market street, is a new concern making tin novelties and specialties for four concerns only. Will build an addition on the back and put in machinery to increase the capacity 150 per cent. The Excelsior Plating Company have moved from 143 North Christian street to 32 West Chestnut street. Have improved and enlarged the plant and doubled the capacity. Expect to do considerable galvanizing. J. M. Kreider is the manager and J. R. Weaver has charge of the plating.

The National Store Specialty Company will move from 409 Lancaster avenue to Bareville, Lancaster county. Will build a new plant there to manufacture pumps, scales, etc., and will have a good plating plant. E. T. Frame and the Slaymaker Lock Manufacturing Corporation are both making large quantities of locks. The Hubley Manufacturing Company have practically a new plant, making gray iron castings, cast iron toys and brass castings. The United Novelty Company succeeded the old Lancaster Silver Plate Company and have moved to 630 North Christian street. They are doing fine and are making silver table ware novelties and gold pens. J. S. Lindemuth opened a watch and clock repair shop at 244 East College avenue. He will add a gold, silver and nickel plating plant. John B. Roth is busy with his 14-karat gold and diamond platinum line of Masonic and Elk emblems. G. W. Bard & Company, of the Woolworth building, has opened connections with a Providence, R. I., house for regular orders of gold plated goods. They have started the Bard Collar Button Company.

The Stehman & Swan Manufacturing Company have bought the property at 856 North Prince street and are making the old line of Stehman tools. They will also make some new lines and enlarge. T. K. Worthington is the president and A. Bowers superintendent. H. M. Musser, of North Prince and New streets, is doing a large business in making sterling silver heads for umbrella handles. He says the pearl, ivory and gold chased work are not so popular as they were. The Vallorbes Jewel Company must enlarge their factory as their place is too small and they are very busy. G. William Reisner is very busy on gold, silver and bronze medals, class pins, emblems, badges, etc. He has a new building, modern equipment, and has installed a first-class plating and lacquering plant.

The Hamilton Watch Company have built a four-story and a two-story addition to their plant. Have 725 hands and turn out 350 high-grade watches a day. Will open a watch-making school in charge of W. H. Manby, the superintendent of the finishing room.

The Ezra F. Bowman's Sons Company have erected a new building for their watch-making school. They also do all kinds of repair work and manufacture jewelry.—H. S.

COLUMBUS, OHIO

SEPTEMBER 2, 1913.

The metal market in Columbus and vicinity has been fairly active during the past month when the season of the year is taken into consideration. One of the bad features is the uncertainty due to tariff tinkering which is being reflected in dullness in the local trade. This is especially true of aluminum for which there is scarcely any market at this time.

Copper is moving fairly well for the season of the year and scrap copper is quoted at 14½ cents to the trade. There has not been any marked price movement in the past month or two.

Brass is strong and the demand is fair. Red brass clippings are quoted at 13½ cents and yellow brass clippings, 9 cents to the trade. Babbitt metal is in good demand and prices are about what they were a month ago. Lead is firm in every respect. Pig lead is quoted at 4.90 to the trade and scrap lead at 6.50.

Metal using concerns in this territory have been having a prosperous summer generally. The automobile concerns have been busy in every way. The John W. Brown Manufacturing Company is about to occupy its new plant on Marion road. The company makes carriage and automobile lamps exclusively.

The Ohio Auto Brass Company is the name of a new concern which opened a plant at 115 West Vine street recently. The concern repairs auto lamps, radiators, windshields, fenders and tanks.

The City Sheet Metal and Roofing Company of Cleveland, Ohio, has been incorporated with a capital of $5,000 to manufacture sheet metal and roofing by Max Greenburg, John E. Fuerst, Herman Suttman, Sam Reich and Mary Rosenblatt.

The Seaton Metal Products Company, of Akron, Ohio, has been incorporated with a capital of $20,000 to manufacture and deal in automobile accessories and metal products of all kinds. The incorporators are Louis J. Rothenbecker, Charles A. Seaton, Walter O. Lee, Charles F. Miller and Charles Scimeca.

Papers have been filed with the secretary of state increasing the capitalstock of the Canton Stamping and Enameling Company from $500,000 to $1,100,000.

Among the corporations in Ohio which have been declared as legally dead by Secretary of State Graves, because of their failure to pay the Willis Tax are the North American Lead Company and the New Process Metal Company, both of Columbus. Both of the concerns have been out of business for some time.—J. W. L.

LOUISVILLE, KY.

SEPTEMBER 2, 1913.

While many of the metal-working industries in this part of the country have been somewhat dull, reflecting the somewhat general slowness of business during the summer, this condition is rapidly disappearing before the normal awakening of things with the approach of fall. The Louisville members of the distillers' supply trade are especially busy just now, and will be more so, as plants which have been overhauled since the end of the current distilling season, a month or more since, are now calling for repairs and new equipment. The threatened advance in the price of copper does not seem to be affecting conditions one way or the other, as the various consuming factors must have the material regardless of price, and just now there seems little likelihood of any such material increase as to curtail consumption.

A. F. Wolke, of Louisville, who has been in the motorcycle business for some time, recently organized the Dixie Manufacturing Company, for the purpose of manufacturing a line of patented motorcycle specialties and accessories. While not all of the actual manufacturing will be done in Louisville, the goods will be assembled and finished in a small shop in Louisville, at 701 East Broadway, and the company will require a nickel-plating outfit for this part of the work.

Matt Corcoran & Co., well-known distillers' supply people, are working to capacity in their plant on North Fifth street in Louisville, having had an unusually early demand for both new goods and repairs from numerous Kentucky and Tennessee plants.

W. P. Davis, of Louisville, a dealer in sheet copper, rod brass and other metals, made a trip recently to Nashville, Tenn., on business, covering other points in that territory. Conditions in that section appear to be very good, according to Mr. Davis, and he handled a good volume of business. Tennessee and the other States to the South escaped, to a large extent, the recent severe drought which visited the Ohio Valley and the Middle West, and prospects for fall business in that section are accordingly better than in most parts of the country.

The National Plating Manufacturing Company, of Louisville, has filed amended articles of incorporation, changing its name to the Mooser-Hoeck Company.

The American Spar Company is a new entry into the fluorspar, lead and zinc field in Western Kentucky, having been organized recently at Salem, Ky. The company has a capital stock of $25,000, and was incorporated by R. A. McCabe, C. H. Copp, K. M. Dowler and others.—G. C. D.

DETROIT, MICHIGAN

SEPTEMBER 2, 1913.

No material change has taken place in the brass and aluminum business during the last month. The different factories are running along on an even plain, and while conditions are not what they might be, they are better than reported in some other places.

Detroit at the present time is said to have more money in circulation, according to its population, than any other city in the country, and it is due to this fact, no doubt, that conditions among the factories are as favorable as they are. But things are not all that could be desired. Orders are coming in slowly and considerable complaint is heard regarding the tightness of money and the slowness of business.

Manufacturers of plumbers' supplies report conditions far below what they should be. While Detroit is showing up well in the building line, conditions outside are such that the demand for brass supplies are way below what they should be. This is believed to be due to the uncertain conditions of the times, and when the newness of the present administration has worn off, a revival in business will be felt.

Brass and aluminum men are looking forward with great anticipation for the opening of the late fall trade. All hope this will arrive early and the factories again resume their old-time vigor and rush. However, none of the manufacturers are reported in any real danger financially, and all seem optimistic with the exception of a certain few, found in every manufacturing center, who never see the bright side of an adverse condition.

Although the season is late, the automobile plants are operating with considerable vigor, many manufacturers engaging on the next year models. The Ford automobile plant is undergoing a great expansion, and when the work is completed will enable greatly increased production.—F. J. H.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Jonathan Bartley Crucible Company, Trenton, N. J., manufacturers of crucibles, have built a one-story addition to their plant on Oxford street.

It is reported that the St. Thomas Brass Company, St. Thomas, Ont., Can., are erecting a new foundry for the manufacture of brass and metal work of all kinds.

The U. S. Aluminum Company has given a large contract which requires 350 tons of steel to the McClintic Marshall Construction Co., for use in plant extension at Arnold, Pa.

The Aluminum Company of America expect to have their plant, now being constructed near Maryville, Tenn., in operation by October 1 at which time the company's contract for Ocoee River power begins.

The Bridgeport Brass Company, Bridgeport, Conn., through F. D. Beeker, assistant purchasing agent, state that the Fletcher Engineering Company of that city have charge of the details of construction of their new building.

The International Acheson Graphite Company, Niagara Falls, N. Y., has let contract for a 40 x 80 foot, two-story addition to its plant at Buffalo avenue, Portage Road and the Niagara Junction Railroad. This addition will be used largely as locker room and laboratory.

The Chase metal works has taken over the business of the Waterville Corporation of Waterville, Conn. An extensive plant is being built at Waterville and will be put in operation as soon as conditions warrant. The plant will make seamless brass tubings, and is controlled by the Chase interests of the Chase Rolling Mill Company, Waterbury, Conn.

Award has been made by the Isthmian Canal Commission for supplying an oil-burning furnace for annealing various sizes and kinds of steel castings; another furnace for drying molds for steel castings; also for four oil-burning ovens, one for drying large cores for steel, iron, and brass castings, and three for drying smaller cores. These are all to be installed in the new foundry building at Balboa and will be supplied by a Pittsburgh firm at $13,740 for the order complete.

The Hawley Down Draft Furnace Company, manufacturers of the Schwartz metal melting and refining furnace, Easton, Pa., have made an unusual offer in relation to their No. ½ Hawley-Schwartz melting furnace. For a limited time only they offer this furnace of 100 pounds capacity, complete, lined with special refractory lining and equipped with a suitable blower and oil pump for $250. This furnace is said to give from 600 to 1,000 heats to a lining and a new lining only costs $10.

The Aluminum Goods Manufacturing Company, of Manitowoc and Two Rivers, Wis., awarded contracts last week for the construction of two new buildings at Two Rivers, consisting of a rolling mill, 44 x 370 ft., and a power plant. The Majestic Construction Company, Milwaukee, was the successful bidder. This company is now completing a large addition to the Manitowoc plant. The present power house at Two Rivers will be turned into a blacksmith shop, and it is the intention to rebuild all frame structures with brick next spring.

The report issued by the large Swiss undertaking, the Aluminum Industry Company of Neuhausen, discloses a net profit of $717,000 against $448,000, and proposes a dividend of 20 per cent., against 14 per cent. last year. It is stated that the exceptionally low prices which prevailed for some time resulted in many new uses being found for the metal, which favorably influenced the development of the industry and enabled the entire production to go into consumption. A new agreement has since been entered into by the various aluminum makers.

It is reported that a brass factory will be built in Garland, Pa., shortly. The factory will be 200 x 50 feet in size and will be devoted to the manufacture of a patented automatic gas stop invented by M. L. Groves, of Tylersburg, Clarion County, Pa. The device regulates the flow of gas under an even pressure at all times and acts as an automatic stop in the event of a break in a connection thus preventing the dangerous escape of gas. The company is capitalized at $50,000 and will manufacture other small brass fittings as well as the stop.

The Tallman Brass and Metal Company, Hamilton, Ont., have purchased the plant and machinery of the Lomas and Nelson Art Metal and Electric Fixture manufacturers. The Tallman Brass and Metal Co. will make up electric fixtures from original designs for the fall trade. They have ample facilities for turning out this class of work as they have an up-to-date plating department in charge of J. Payne. Their foundry, finishing department and spinners will also be brought into action to turn out a high-class fixture, a large amount of which are already being brought in from the United States.

Charles Mundt & Sons, manufacturers of perforated metals, Jersey City, N. J., who were burned out of their plant in the disastrous fire in Jersey City on August 20, report that they are now located in temporary quarters and have four presses running and expect shortly to increase this number to ten. A contract has been given out for a new building on the site of the old one, but will have about 10,000 feet more floor space and orders have also been given for new machinery. The company expects to be running within two months and the building will be entirely fireproof, the construction being of brick concrete with steel sashes and wire glass windows.

The Metal Arts Company, Inc., has been incorporated at Rochester, New York. The company is capitalized at $5,000, with $2,000 paid in and will manufacture a general line of jeweler's and electro-platers' badges, emblems and advertising novelties.

The officers are J. Jack, President; Arthur Rathen, vice-president, and Adolph Wohl, secretary and treasurer. Both Mr. Jack and Mr. Wohl are former employees of Bastion Brothers Company. Mr. Jack was connected with them for 13 years as practical diamond setter and jeweler, and lastly superintendent of the metal department. Mr. Wohl was foreman plater for the past five years.

The Haas Manufacturing Company, Inc., has been organized to manufacture polishing materials, electro platers' supplies, etc. The main office of the company is in the Marbridge building, West 34th street and Broadway, New York, and their manufacturing plant is at Glenwood, Long Island, N. Y. The officers of the company are: H. M. Bronner, president; Wm. C. Poertner, vice-president, and H. L. Hass, treasurer and secretary. It is announced H. L. Hass will have charge of the manufacturing, he having had thirty years experience in this line, having been superintendent, chemist and treasurer of the old Zucker, Levett and Loeb Company for over twenty-five years, during which time he perfected a number of inventions, including the corrugated nickel anode, a process of melting nickel in cupolas, and various compositions for polishing.

The Pangborn Corporation has been organized and properly financed to take over for efficient manufacture and operation the business of the Thomas W. Pangborn Company. The new corporation, with the troubles of undercapitalization which beset the old company eliminated through the association of men of means and influence, will be in position to more satisfactorily and efficiently handle the growing business and to maintain stock assuring patrons of the old company and new customers quicker shipments and better all-round service than has ever been possible before. The same quality of output will be maintained and with the new business conducted by the executives and staff of the old concern, fully conversant with present installations and experienced to produce the best in the future, customers' interests and requirements will be better served than ever heretofore.

MUELLER MFG. CO.'S OUTING

The first picnic of the employees of the Mueller Manufacturing Company, Ltd., of Sarnia, Ont., Canada, was held on Thursday, August 28, at Tashmoo Park on the St. Clair river. The party numbering 400, composed of the employees, their families and invited guests, which included the Mayor, all city officials of Sarnia, the master plumbers of the city and their employees.

The entire party boarded the steamer *City of Toledo* at 8 a. m. and arrived at the grounds at 10 a. m., where one of the most enjoyable days was spent in sports and dancing. The return journey was made at 6:30 p. m., and the president of the Master Plumbers' Association thanked Mr. O. B. Mueller, the president of the company, for the pleasant and profitable day's enjoyment they had spent. Mr. Mueller in reply extended to them a cordial invitation to join with him next year; he also thanked them for their patronage since the company has been established in Canada, all plumbing brass goods used in Sarnia are Mueller high-grade goods.

SOUTHERN ALUMINUM CO. WORRIED

Theodore Sternfield, treasurer of the Southern Aluminum Company, organized with a capital of $12,000,000 for the purpose of establishing aluminum manufactories to harness the Yadkin river at Whitney, in Stanley county, has appealed to the members of the North Carolina delegation in Washington to urge the maintenance of the tariff rate of four cents per pound on aluminum, as contained in the tariff bill, as it left the house.

Sternfield declared that under the former rate of seven cents a pound the aluminum industry prospered in this country, and even under the rate of four cents, as proposed by the Underwood bill, his company intended to establish an enormous industry for Carolina. The senate cut this in half, placing it at two cents per pound, and the company still hoped to do business, but Sternfield declared that if the amendment proposed by Senator Kenyon, placing aluminum on the free list, is adopted, his company will abandon its project and North Carolina will lose what promises to be an enormous industry within a few years.

LUMEN BEARING COMPANY

The Lumen Bearing Company is making an addition to its Buffalo, N. Y., plant which amounts to about 15,000 square feet. On the ground floor a provision is being made for an increase of general stores, fuel storage, sand storage and the cleaning room and shipping room are being relocated in order that the output can be taken care of to better advantage. Sidings are being relocated so that fuel, iron and metal for the Babbitt room can be elevated and the distribution of fuel to various parts of the plant be handled to better advantage. The present overhead trolley system and the Industrial track are being extended to take in the new construction.

On the second floor of part of the addition provision is being made for the Babbitt room, carpenter shop and an experimental department, the latter being moved from the present laboratory room on account of the demands for general experimenting in engineering work. Roughly the increase amounts to 20 per cent., as by the new arrangement the number of molders' benches is increased to 60 in place of 50. In the Babbitt department the increase is about 40 per cent. The construction of the new building is steel concrete, the "I" beam and flat slab construction being used throughout the second floor and the roof. The roof of the second floor has been extended south some 80 feet to provide for necessary quick additions to plant when business is running at its maximum or at an overload.

The Toronto plant is also active. Plans are being prepared for a very substantial addition which will probably be completed this year.

CHANGE IN FIRM NAME

The National Plating and Manufacturing Company, Inc., Louisville, Ky., have changed their name to the Mooser-Hoeck Company, and will continue business at the same address. The above concern make a specialty of metal spinning and electroplating.

FIRES

Fire destroyed four of the factory buildings of the Franklin H. Kalbfleisch Company, Railroad and Hill streets, Waterbury, Conn., at a loss of about $20,000. The firm are manufacturing chemists and will rebuild on a large scale. Joseph A. Garde is general manager, who states that they are doing business and filling all orders.

REMOVALS

The San Francisco office of the Goldschmidt Thermit Company, 432-436 Folsom street has been moved to 329-333 Folsom street, San Francisco, Cal.

The Worcester Brass and Electro-Plating Company, 34 Southbridge street, Worcester, Mass., have moved their plant to larger and better quarters at 71 Central street.

E. F. Lake has moved his metallurgical engineering business from Bayonne, N. J., to Detroit, Mich., where he is located at 1453 Waterloo street.

BUSINESS TROUBLES

I. M. Jacobson & Sons, metal merchants, Detroit, Mich., report under date of August 30 that on August 27 they executed trust mortgages on their business assets, including the real estate

at their Catherine street plant, for the equal protection and benefit of all their creditors. It is claimed that the firm is entirely solvent, but is pressed for ready money owing to large expenditures made in equipping the Catherine Street plant. The concern is now doing nearly $10,000 worth of business monthly at an overhead expense of about $900 and it is expected that the business will be worked out in good shape if a little indulgence by the creditors is shown. A meeting of the creditors will be held on September 6 for the purpose of discussing the situation and arranging an extension, if possible, on the indebtedness. Further particulars are not available at time of going to press.

FOREIGN TRADE OPPORTUNITIES

[In applying for addresses at Bureau of Foreign and Domestic Commerce, Washington, D. C., refer to file number.]

No. 11271. Graphite.—A business man in a European country informs an American consul that he desires samples of the "fattest" qualities of graphite for lead pencils, lubrication, and foundry purposes. Samples and prices may be forwarded to the consulate.

No. 11482. Wire.—An importer of wire in a European city desires American connections. He now imports from other European countries, but believes the direct steamship sailing between American and local ports should enable him to make direct importations from the United States. The wire is used locally mostly for can-opening keys, and the importer believes the quality of copper in the American wire makes the keys less corrosive than other kinds. The consul who forwarded the report advises that the sizes of wire used range from 3.2 millimeters to 3.8 millimeters. English may be used in correspondence, though Norwegian would be preferable.

[Where addresses are omitted they may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C. In applying for addresses refer to file number.]

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

Ideal Brass Works, Indianapolis, Ind., capital $10,000. To deal in metals. Incorporators: E. F. McCoy, E. M. Adams, D. L. Stone.

The Illinois Art Metal Company, Springfield, Ill. Capital, $20,000. To manufacture sheet metal products. Incorporators: C. N. Pesegate, G. D. Lockie and Charles A. Knox.

The General Bronze Foundry Company, Cleveland, Ohio, Capital, $10,000. To make all kinds of castings and patterns. Incorporators: John Harsch, Louis Hansen, Frank J. Borsch, Theodore Werne and Sheldon W. Hughes.

The J. D. Gerken Company, Toledo, Ohio. Capital, $20,000. To deal in sheet metal and products. In corporators: John D. Gerken, Jane E. Gerken, Charles T. Lawton, Claude C. Guyaur and William J. Sedelbauer.

A new nickel company has been recently formed under the name of the British-American Nickel Corporation, Ltd., of Toronto, Can. The company has been incorporated with $20,000,000 capital and is authorized to acquire and develop nickel, gold, silver, copper, coal, salt and other mines. The list of incorporators includes: Dr. F. S. Pearson, J. F. Taylor, J. E. McAlister, Benjamin B. Lawrence, Walter Gow and Miller Lash.

PRINTED MATTER

Machinery.—The miscellaneous machinery catalog of the Standard Machinery Company, Providence, R. I., dated 1914, has just been issued. This catalog includes descriptions and illustrations of presses of all kinds.

Monel Metal.—The Biddle Bulletin, published by the Biddle Hardware Company, Philadelphia, Pa., for August, 1913, contains a great deal of valuable information relating to Monel metal. A full description of various articles of Monel metal is contained in the issue together with a list of hot rolled Monel metal sheets and rods, which are kept in stock by this company.

Recording Instruments.—The Bristol Company, manufacturers of Bristol's recording instruments, Waterbury, Conn., have issued bulletins Nos. 175, 176 and 178, which are descriptive of electric resistance thermometers, model 162, electric pyrometers and wet and dry bulb recording thermometers. The bulletins are fully illustrated and may be had upon application to the Bristol Company.

Tumbling Barrels.—The Globe Machine & Stamping Company, Cleveland, Ohio, have issued an interesting little booklet giving complete descriptions together with illustrations of the line of tumbling barrels manufactured by them. Four types of tumbling barrels are described. They are: Globe tilting tumbling barrels, Globe horizontal tumbling barrels, Globe sand tumbling barrels, and the Globe barrels for burnishing with steel balls.

Boron Nitride.—E. Weintraub has obtained a patent from the United States for a boron nitride, which is claimed is a new refractory material. The principal features claimed for this substance are that it has a high resistance to the passage of an electric current, is infusible at the highest heat of an electric arc and is chemically inert. Boron nitride can be prepared according to any of the methods that are recommended in the chemical literature.

Brushes and Brooms.—The J. W. Paxson Company, Philadelphia, Pa., describe in bulletin No. 30 their very extensive line of brushes and brooms made of wire and bristles which are manufactured by them for use in foundries, plating shops, textile mills, pattern shops, etc. This company states that they are the only foundry supply house that actually makes the major portion of the wire and bristle brushes which are described in this catalog. Copies of bulletin 30 will be sent upon request.

Standardized Presses.—The Baird Machine Company, of Bridgeport, Conn., have issued a booklet 201 descriptive of Baird's Paper Model. This booklet gives full information relating to the Baird system of presses standardized for automatic attachments, which means that the press is so machined that the automatic attachments can be applied at any time when required. This is a new feature which has been inaugurated within the last year. Copies of this booklet may be had upon request.

Furnaces.—The Garrett-Tilley Company, Inc., New York, have issued Bulletin No. 41, which treats of their over-fired heat treating and annealing furnaces, accurate temperature, use oil or gas fuel. This bulletin says that the construction of these furnaces is such that the heat passes freely into the heating chamber, as the arc of the inlet ports from the combustion chamber remain the same regardless of the amount of material charged. The heat comes from above and therefore there are no bottled-up gases underneath, no high velocity gases in contact with the material and no arches under heat and supporting weight. Copies will be sent upon request.

Price Maker and Profit Determiner.—J. W. Conchar, 1 Park Row, New York, is now distributing a very valuable book for the use of merchants and manufacturers. This book is intended to provide a rapid method to arrive at a profitable selling price and to convert the business man to a belief that the true cost is not the price paid for an article, but is the price paid, plus freight and expense of selling the articles. The book is so arranged that it shows the price at which goods must be sold to yield a net profit of from 1 per cent to 25 per cent. of selling price. The price of this book is $2 and a more extensive description of it will be given upon request.

GOVERNMENT NEEDS

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., September 16, 1913, and publicly opened immediately thereafter, to furnish at the navy yard, Portsmouth, N. H., two molding machines (squeezer type). Applications for proposals should refer to Schedule 5800. Blank proposals will be furnished upon application to the navy pay office, Portsmouth, N. H., or to the Bureau. T. J. Cowie, Paymaster General, U. S. N.

METAL MARKET REVIEW

NEW YORK, September 2.

COPPER.

The copper market during the month of August has been very active and prices were gradually advanced from around 15¼ cents at the opening to sales made at 16 cents at the close. Europe has been a free buyer and home consumers have covered their requirements for September and October. Consumers generally have been bare of stock and frequent calls for September contract copper have been made in August. The market is very strong and producers are all well sold up. Spot copper is actually scarce and at a slight premium over futures. The strike at the Lake mines has helped to strengthen the situation and Lake copper is at a premium of ¼-cent per pound.

Statistically the copper market is in a very strong position; the exports have been very heavy, over 34,000 tons against 29,596 tons last month and 29,526 tons during the month of August last year. The European statistics show a further decline for the month of 1,200 tons with a stock at teh end of August of 26,500 tons against 35,630 tons a month ago. The producers figures are likely to show a big decrease for the month.

Prices today: Lake scarce and nominal, 16¼ cents; Electrolytic, 16 cents; casting, 15⅞ cents.

Later: September 8, market is very strong. Lake, 16¾ to 17c.; electrolytic, 16¾c.; casting, 16⅝c.

TIN.

The tin market in London seemed to get on to a better basis and prices have steadily advanced instead of the violent fluctuations that were in vogue during June and July. Tin opened at around 41 cents and closed at around 43 cents. The consumption for the month was not very heavy, 3,600 tons. Prices, 5.10 ton lots, spot 43.00. October-November, 42.75.

LEAD.

The lead market has been very firm and the trust put prices up ¼ cent per pound to 4¾ cents, New York basis. The strike at the mines sent prices up, and although the strike has now been settled the market is very firm and the trust price of 4¾ cents is the lowest market price today.

SPELTER.

The market for spelter has been quite active and prices have advanced from around 5.40 a month ago to close to 6 cents, New York, today. Price in St. Louis is 5.85 to 5.85. Sheet zinc has advanced ½ cent per pound to 8 cents f. o. b. smelter.

ALUMINUM.

The Aluminum market has been weak and unsettled and prices have declined nearly 2 cents per pound from 23¼ cents at the opening to a nominal quotation today of 21½ to 22 cents. Foreign aluminum in bond is quotable at 18¼ to 18½ cents.

ANTIMONY.

The Antimony prices are a shade easier than a month ago. Cookson's is quotable at 8⅜ cents, Hallett's at 7¾ and Hungarian grade at 7⅜ cents.

SILVER.

The silver market has been very dull and fluctuations slight, opening at around 59⅝. New York price today is unchanged, 59⅝ New York, 27½d. London.

QUICKSILVER.

The wholesale price of quicksilver has been held steady at $39, with jobbing lots at $39.50 to $40 a flask.

PLATINUM.

Market is shade easier at around $44.00 to $44.50 for ordinary refined and $50 for hard.

SHEET METALS.

The price of sheet copper has been advanced to 22 cents base. Copper wire is firmer at around 17¾ to 18 cents base. High sheet brass is firmer and quotable at 15¾ cents wholesale.

OLD METALS.

Market for all copper scrap metal has been quite active and prices generally are higher than a month ago, with the higher prices now ruling for tin, lead and spelter.—J. J. A.

AUGUST MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	16.25	15.25	15.85
Electrolytic	16.00	15.25	15.70
Casting	15.87	15.00	15.60
TIN	43.60	40.60	41.75
LEAD	4.75	4.50	4.65
SPELTER	5.95	5.65	5.80
ANTIMONY (Hallett's)	8.15	7.75	8.00
SILVER	59.75	59.00	59.29

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

		September 8, 1913. Pounds.
Stocks of marketable copper of all kinds on hand at all points in the United States, August 1, 1913..		53,594,945
Production of marketable copper in the United States from all domestic and foreign sources during August, 1913		131,632,362
		185,227,307
Deliveries:		
For domestic consumption	73,649,801	
For export	73,263,469	
		146,913,270
Stocks of marketable copper of all kinds on hand at all points in the United States, September 1, 1913..		38,314,037
Stocks decreased during the month of August		15,280,908

WATERBURY AVERAGE

The average price of Lake Copper per pound as determined monthly at Waterbury, Conn.

1912—Average for year, 16.70. 1913—January, 17; February, 15.50; March, 15⅛; April, 15.75; May, 15⅞; June, 15¾; July, 14¾; August, 15⅝.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad. pages.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

Metal Prices, September 8, 1913

METAL PRICES.

	Price per lb. Cents.
COPPER—PIG AND INGOT AND OLD COPPER. Duty Free. Manufactured 2½c. per lb.	
Lake, carload lots, nominal	16.75
Electrolytic, carload lots	16.75
Castings, carload lots	16.63
TIN—Duty Free.	
Straits of Malacca, carload lots	43.00
LEAD—Duty Pig, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.80
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	5.95
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots, f. o. b. factory	25.00
100 lb. lots, f. o. b. factory	24.00
Ton lots, f. o. b. factory	22.00
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	8.35
Hallett's cask lots	7.75
Hungarian grade	7.35
NICKEL—Duty Ingot, 6c. per lb. Sheet, strip and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots. Blocks according to quantity	40 to .45
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL—Duty 20 per cent	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	$1.50
BISMUTH—Duty free	$2.00
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad valorem	.98
QUICKSILVER—Duty 7c. per lb	.56
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	45.50
SILVER—Government Assay Bars—Duty free	.59⅝

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% ..... according to quantity	27 to 32
Silicon Copper, 20% ..... " "	34 to 36
Silicon Copper, 30% guaranteed " "	36 to 38
Phosphor Copper, guaranteed 15% ..... " "	24 to 28
Phosphor Copper, guaranteed 10% ..... " "	23 to 27
Manganese Copper, 25% ..... " "	25 to 29
Phosphor Tin, guaranteed 5%. " "	61 to 63
Phosphor Tin, no guarantee.. " "	49 to 52
Brass Ingot, Yellow ..... " "	11⅝ to 12⅛
Brass Ingot, Red ..... " "	15 to 15½
Bronze Ingot ..... " "	14¼ to 14¾
Manganese Bronze ..... " "	18½ to 20
Phosphor Bronze ..... " "	20 to 23
Casting Aluminum Alloys .... " "	21 to 24
PHOSPHORUS—Duty 18c. per lb. According to quantity	30 to 35

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
14.00 to 14.25	Heavy Cut Copper	15.25 to 15.50
13.75 to 14.00	Copper Wire	15.00 to 15.25
12.25 to 12.50	Light Copper	14.00 to 14.25
11.75 to 12.25	Heavy Mach. Comp	13.75 to 14.00
9.00 to 9.25	Heavy Brass	10.00 to 10.25
7.25 to 7.50	Light Brass	8.50 to 8.75
7.50 to 8.00	No. 1 Yellow Brass Turnings	9.25 to 9.50
11.00 to 11.50	No. 1 Comp. Turnings	12.00 to 12.50
4.00 to ——	Heavy Lead	—— to 4.40
3.75 to ——	Zinc Scrap	4.40 to 4.50
6.00 to 7.00	Scrap Aluminum Turnings	8.00 to 9.00
13.00 to 14.00	Scrap Aluminum, cast, alloyed	15.00 to 16.00
15.00 to 16.00	Scrap Aluminum, sheet (new)	17.00 to 18.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

PRICES OF SHEET COPPER.

BASE PRICE, 22 Cents per Lb. Net.

SIZE OF SHEETS.		64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
Width.	LENGTH.	Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 inches.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 inches.	4	6							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 1½c. per lb.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	8 less 8%
Casks, jobbers' prices	8½c.
Open casks, jobbers' prices	9c.

Metal Prices, September 8, 1913

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect September 8, 1913, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.15¾	$0.17⅜	$0.19¼
Wire	.15½	.17⅝	.19¼
Rod	.15½	.18⅜	.20¼
Brazed tubing	.20¼	—	.24
Open seam tubing	.20¼	—	.24
Angles and channels	.20¼	—	.24

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass.... ⅛c. per lb. net advance
" —Best spring, drawing and spinning brass.... 1⅛c. " " " "
Wire —Extra spring and brazing wire..... ½c. " " " "
" —Best spring and brazing wire..... 1c. " " " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.16	$0.18⅞	$0.20½
Wire	.16¾	.18⅞	.20½
Rod	.16¾	.19⅝	.21½
Brazed tubing	.21½	—	.25¼
Open seam tubing	.21½	—	.25¼
Angles and channels	.21½	—	.25¼

Net extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass.... ⅛c. per lb. net advance
" —Best spring, drawing and spinning brass.... 1⅛c. " " " "
Wire —Extra spring and brazing wire..... ½c. " " " "
" —Best spring and brazing wire..... 1c. " " " "

BARE COPPER WIRE—CARLOAD LOTS.

17¼c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	22½c.	per lb. base
100 lbs. to 300 lbs. in one order	23c.	" " "
Less than 100 lbs. in one order	24½c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 20c. per lb.
Seamless Copper Tubing, 24c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet— Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 50 and 5%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red	19c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	15½c.	" "
" " " Rectangular sheets other than Sheathing	18c.	" "
" " " Rod	15½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 25¾c. net.
German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.
Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.
Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	500 lbs.	50 lbs.	Less than 50 lbs.
20 and heavier	3-30	33c.	34c.	36c.	38c.
	3-30	34c.	35c.	37c.	39c.
21 to 24 inclusive	30-48	36c.	37c.	39c.	41c.
	48-60	39c.	40c.	42c.	44c.
25 and 26	3-30	35c.	36c.	38c.	40c.
	30-48	37c.	38c.	40c.	42c.
27	3-30	36c.	37c.	39c.	41c.
	30-48	39c.	40c.	42c.	44c.
28	3-30	37c.	38c.	40c.	42c.
	30-48	40c.	41c.	43c.	45c.
29	3-30	38c.	39c.	41c.	43c.
	30-48	42c.	43c.	45c.	47c.
30	3-30	39c.	40c.	42c.	44c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. Charges made for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 24 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	.	..	26	23	..	..	13	19	9	8	15	22
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..
16.	.065.	..	..	..	..	..	27	26	26	22	22	20	20	20	20	26	30	36
18.	.049.	..	..	..	..	32	29	28	27	24	25	25	25	..	..	..	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	48	57	80
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb....	33	33½	33½	34	34½	35	35½	36	37	38	39	44	47

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to	No.	19,	B. & S.	Gauge, inclusive	$0.60
6	"	"		19,	"	"	.70
9	"	"		19,	"	"	.85
12	"	"		19,	"	"	1.00
15	"	"		19,	"	"	1.15
16	"	"		19,	"	"	1.20
18	"	"		19,	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.
For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 1c. below to 4c. above the price of bullion.
Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.